The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

XIX No. 11 NOVEMBER, 1922

$2 a year, 20 cents a copy

Published at Cooperstown, N. Y.
New York Office 1123 Broadway

Dole Syphon Air Valve

"Embodying Dole Thermostatic Principles"

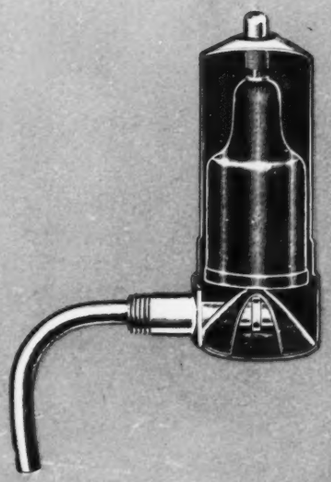
Money and Experience Cannot Make a Better Non-adjustable Syphon Air Valve.

There has been a constant demand for a non-adjustable syphon (all metal) air valve---a valve embodying Dole thermostatic principles, quality, material and workmanship and a valve that can be sold at a popular price showing a "long trade profit." To meet this demand we have perfected the Dole Syphon Air Valve.

HEAT INSURANCE

It is impossible here to tell you of all the exclusive features and beauty of design of this wonderful valve. The unique and efficient construction of the venting seat, the special syphon lock collar which prevents accidental or intentional removal of syphon from valve---the float rest which is open on four sides permitting water to drain thru the syphon---all these are features which every up-to-date steam fitter should be familiar with.

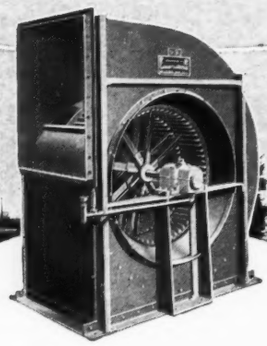
If you are open minded---if you really want a better air valve at a lower price, send for our diagram blue print showing detailed specifications, also prices and discounts.

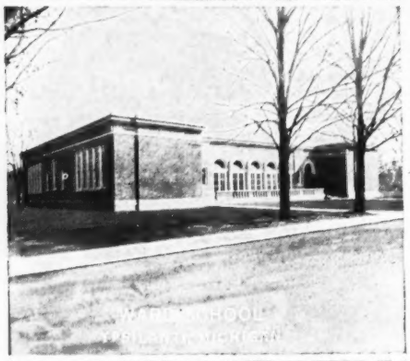


The Dole Valve Company

1931 Carroll Ave.,
Chicago

Schools Equipped with
CLARAGE – KALAMAZOO Multiblade Fans

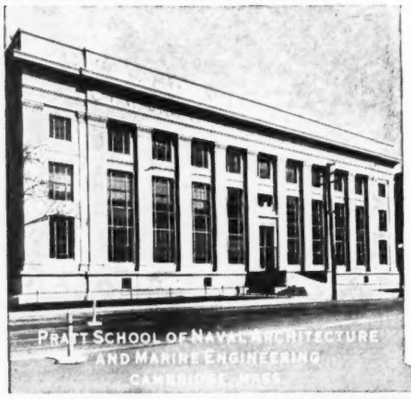




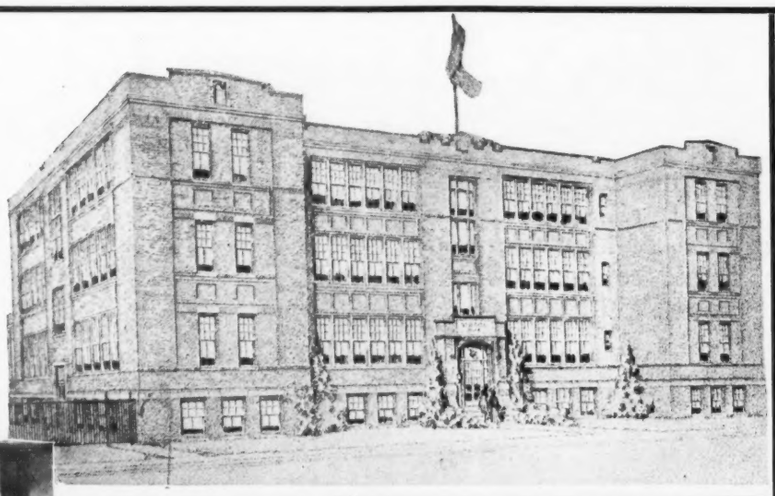
AN EVER INCREASING number of leading architects are specifying Clarage Kalamazoo Multiblade Fans, for the simple reason that they have found the product unusually reliable and the service prompt and courteous.

CATALOG Number Fifty-two describing the Multiblade Fans will come to you at your request.

CLARAGE FAN COMPANY
Branch Offices in All Principal Cities
***Main Office and Factory,* KALAMAZOO, MICH.**



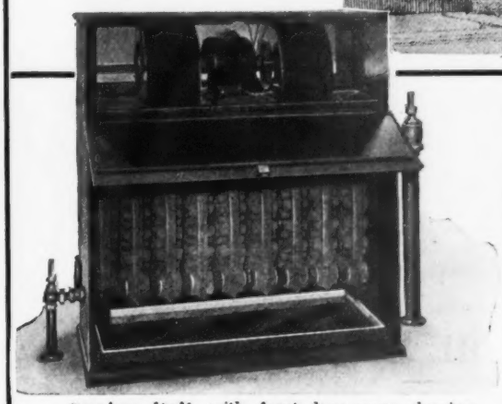
The Peerless unit is a mechanical gem. Has a radiator of the vento type, noted for efficiency; ball bearing motor requiring little attention; fan wheels of aluminum, perfect in design and balance; and a mixing damper without a peer.



Hamilton School Harrison, N. J.

Equipped with seventeen Peerless Units

Joseph W. Baker Architect



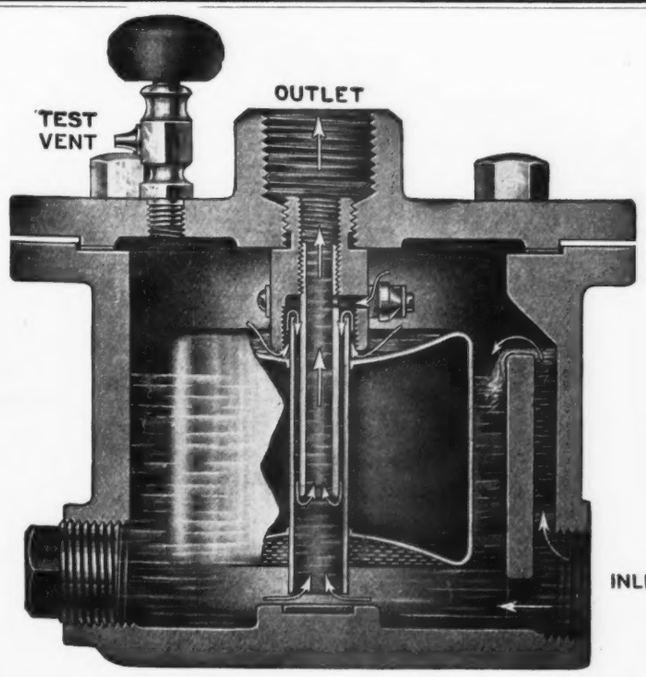
Peerless Unit with front door open showing fans and motor. Front panel and baffle removed, showing special Peerless Vento radiation and humidifying pan.

Service, Efficiency and Economy

Here is a heating and ventilating unit that combines service with efficiency and produces economy. Service in supplying pure fresh air to the required amount with perfect distribution and at the right temperature. Efficiency in the operation of the Peerless mixing damper that will by pass all or any portion of air around the radiator and economy in installation cost and the saving of fuel.

Familiarize yourself with this Peerless Unit by sending for our catalog.

PEERLESS UNIT VENTILATION CO.
437 West 16 St. New York City



MARSH

DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

We Invite Correspondence

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

FOUNDED 1865

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents Indicating and Recording Gauges

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario

"Oil City" Boilers for Heating

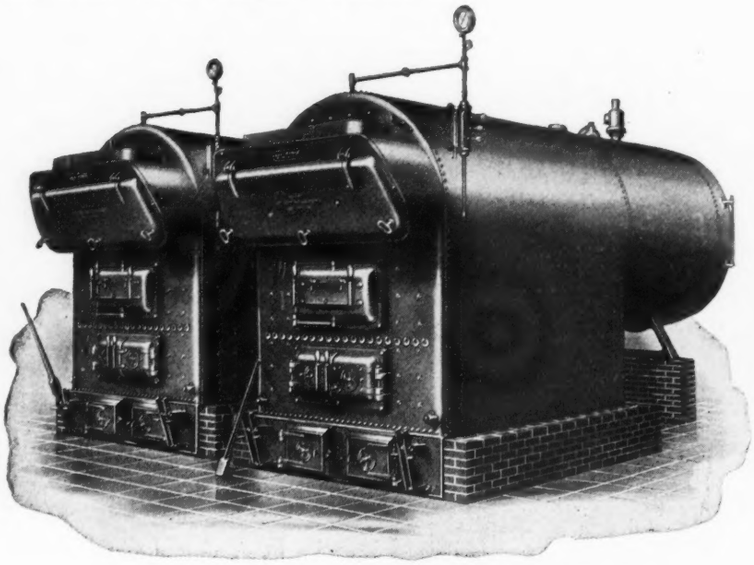
Return Tubular Portable Firebox

Will burn any kind of fuel,—hard or soft coal, oil, gas or lignite. Note use of high firebox, giving ample combustion area to make possible the use of low-grade fuels.

Why "Oil City" Boilers are Ideal for Heating Work:

These boilers are adaptable for Apartments, Churches, Club Houses, Court Houses, Hospitals, Garages, Hotels, Office Buildings, Large Residences, Post Offices, Schools, etc., because they are Safe, Efficient, Dependable, and, being Self Contained, require little attention.

Circular H-5, H-7, H-12, H-13, gives Full Specifications, Ratings and Weights.



Built of Steel, in Accordance with the A. S. M. E. Code

OIL CITY BOILER WORKS, OIL CITY, PA.

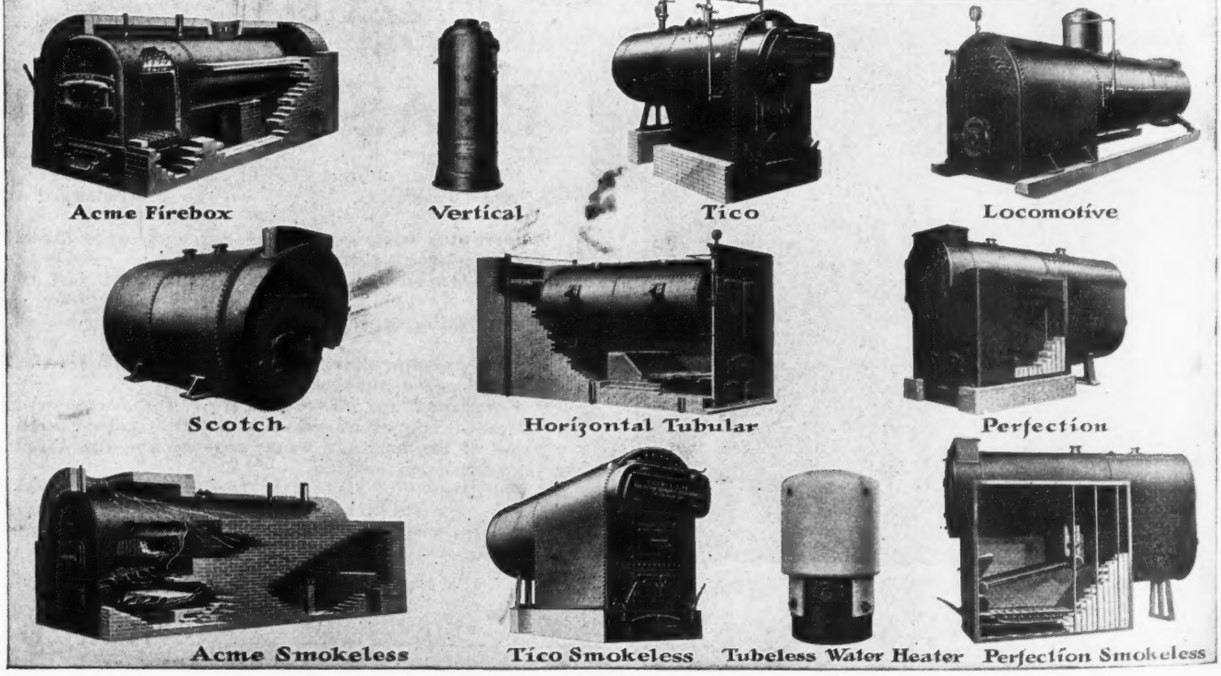
BRANCH OFFICES

NEW YORK, 501 Fifth Ave. CHICAGO, No. 1224 Marquette Building PITTSBURGH, House Building

REPRESENTATIVES

CLEVELAND, OHIO PHILADELPHIA, PA. ATLANTA, GA. SEATTLE, WASH. BALTIMORE, MD.
SAN FRANCISCO, CAL. ST. PAUL, MINN. BOSTON, MASS. DENVER, COL. HOUSTON, TEXAS

TITUSVILLE BOILERS



The Titusville Iron Works Company, Titusville, Penn. Manufacturers of Firetube Steel Boilers for Power and Heating, Fronts, Grates, Castings, Smoke Stacks, Tanks, and Oil Well Boilers; Steam, Gas, Oil, and Gasoline Engines, Pumping Powers and Oil Well Machinery.

NEW YORK OFFICE 152 W. 42d St. BUFFALO OFFICE 821 Marine Trust Bldg. PITTSBURGH OFFICE Farmers Bank Bldg. CHICAGO OFFICE 53 W. Jackson Blvd.

SMOKE is unconsumed FUEL

A Kewanee Smokeless Boiler burns *all* its coal—hence none of it is wasted up the stack as smoke. The man who pays the coal bill appreciates the saving—usually it is a big one.

Furthermore, Kewanee Smokeless Boilers have "burned" their way into the hearts of owners by their ability to burn *any* coal. Your reputation is safe when you specify and install a Kewanee.

KEWANEE BOILER COMPANY

KEWANEE, ILLINOIS

Steel Heating Boilers, Radiators, Tanks, Water Heating Garbage Burners

BRANCHES:

CHICAGO	Washington and Market Sts.	MILWAUKEE	835 Merch. & Mfrs. Bldg.
NEW YORK	47 W. 42nd St.	PITTSBURGH	945 Oliver Bldg.
DES MOINES	315 Hubbell Bldg.	DENVER	514 Boston Bldg.
KANSAS CITY	2014 Wyandotte St.	DALLAS	809 Southwestern Life Bldg.
INDIANAPOLIS	509-10 Occidental Bldg.	DETROIT	1772 Lafayette Blvd.
ST. LOUIS	1212 Chemical Bldg.	TOLEDO	1121-22 Nicholas Bldg.
MINNEAPOLIS	708 Builders Exchange	CLEVELAND	706 Rose Bldg.
COLUMBUS	808 First Nat'l Bank Bldg.	ATLANTA	1524-25 Candler Bldg.
SALT LAKE CITY	204 Dooly Bldg.	SAN FRANCISCO	72½ Fremont St.

CANADIAN REPRESENTATIVES—The Dominion Radiator Co., Ltd.

Toronto, Ont., Montreal Que., Winnipeg, Man.
Hamilton, Ont., St. John, N. B., Calgary, Alta.

KEWANEE

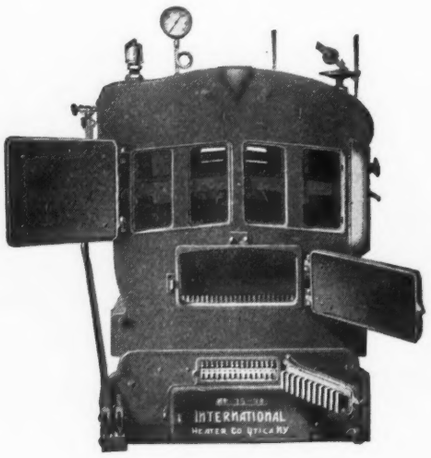
Take a Look
at the Inside of this Boiler
See How Easy it is to Clean

OF what importance is this to you — the Dealer?

Well, you know a boiler that is hard to clean will be neglected. A dirty boiler means high coal bills and high coal bills mean a dissatisfied customer.

That is why large clean out doors are placed on the front of *Economy Boilers*—so that the flue surfaces can be kept free from soot. An accumulation of soot lessens the evaporative power and causes an increase in the fuel consumption.

This, *Easy to Clean feature,* is a strong point in favor of the Economy, but is only one of the many good features of Economy design.



ECONOMY BOILERS

Learn more about Economy Boilers by sending for catalog H-1296.

INTERNATIONAL HEATER COMPANY UTICA, N. Y.

BRANCHES: NEW YORK CHICAGO CLEVELAND NASHUA, N. H.

IMICO HEATING BOILERS

For Water and Steam

Various Sizes

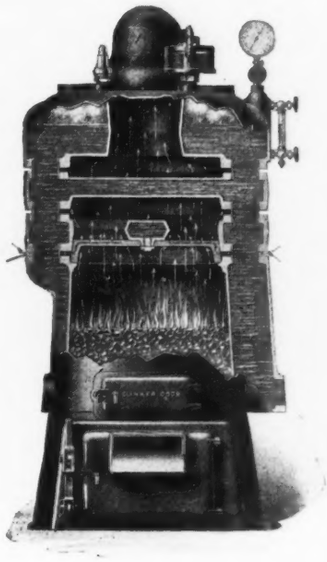
Imico Vacuum Heating System

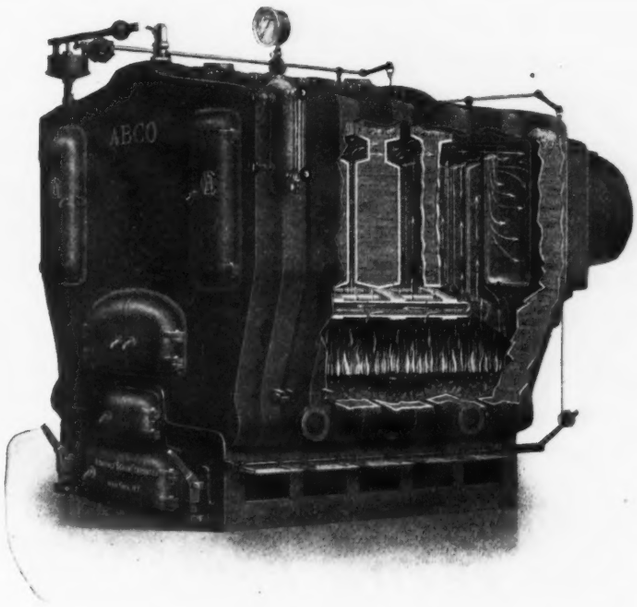
Write For Catalogue

Manufactured by

ILLINOIS MALLEABLE IRON CO. Chicago, Ill.

BOILER PRECISION





ABCO BOILERS ARE SUITABLE FOR ANY JOB

Whether for large or small homes, apartment houses, office buildings, libraries or factories the words ABCO BOILERS in your specifications will mean that you are getting BOILER PRECISION—the right boiler for the job with an assurance of efficiency and economy.

Consider these features—features that produce results whether it is in a small house or large building that the ABCO boiler is installed.

The heating surfaces of the ABCO BOILERS are 75% direct which remains efficient without cleaning.

Abco Boilers will burn anthracite and bituminous coal and coke and are rated according to the heating surface contained in the boiler. Coal capacity provides for the operation of eight hour firing periods and numerous air inlets in base afford a rapid rate of combustion if desired.

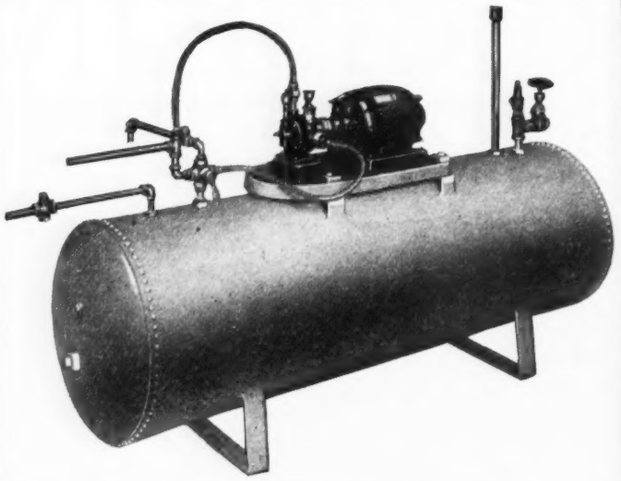
The smokless feature of the Abco Boilers is designed as a part of the boiler and not an attached device. Free oxygen is distributed throughout the entire area of the grate surface above the fire in fine streams and not introduced in a large volume at one given point.

Abco Boilers are fully described in a new catalog just out. To have it will mean a contribution to your knowledge of heating practice. Your name and address will bring it.

ADVANCE BOILER CORPORATION
Grand Central Terminal, New York

We can make immediate shipments.

ABCO BOILERS



The Combustion Fuel Oil Burner

As safe and simple as your electric lights

MR. HEATING CONTRACTOR

The Combustion Fuel Oil Burner, which has been sold exclusively through the distributor, will now be sold directly through the heating contractor.

The Combustion Fuel Oil Burner can be installed in any kind or make of heater. The system consists of 5 simple elements —air jet nozzle, pilot light, motor-driven air pump, automatic thermostatic control and fuel tanks. The air jet nozzle is the burner and fires directly into the fire pot by spraying the oil into the flame of the pilot light. The pilot light is a gas flame that ignites the sprayed fuel oil. The pump furnishes a uniform supply of air and oil and the electric power required to run the motor is very slight.

Let us have your inquiry and get in on a tide of new business. Excellent proposition to dealers.

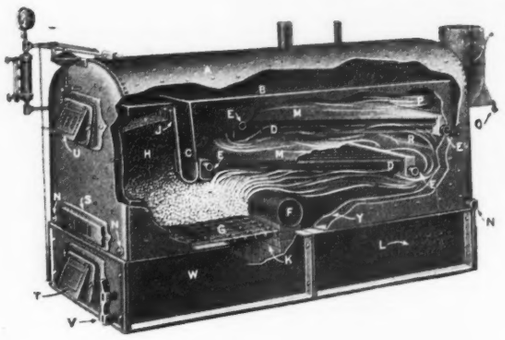
The Combustion Company

General Sales Office: 728 South Michigan Avenue
General Office and Factory: 4256 North Western Avenue
CHICAGO, ILLINOIS

Canadian Business
International Combustion Co. Ltd.
234 Beaver St. Montreal, Canada

INVESTIGATE

The Latest Herbert Magazine Water Tube Smokeless Boiler



These are a few of the Features

(1) No smoke after the fire is thoroughly started. (2) No Flues to clean. (3) Burns Soft Coal Successfully. (4) Carries steam from twelve to fifteen hours with one fire. (5) Has downdraft and direct draft to suit weather conditions. (6) It is all shell surface, which means economy. (7) Can be set in brick, which gives one more return of the hot gases. (8) No Brick Arches or other flimsy devices. (9) Natural draft and the highest economy. (10) Built in steam sizes from 500 square feet to 25,000 square feet

HERBERT

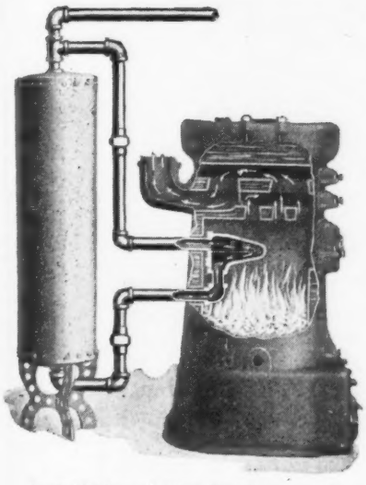
Has combined the downdraft feature with the direct draft and dispensed with the objectionable parts of both.

HERBERT BOILER COMPANY

Root & LaSalle Sts.

Chicago, Illinois

EXCELSO For Every Type of Heating Plant



Installation of Fire-Pot Generator

You can now specify a more economical hot water supply during the heating season.

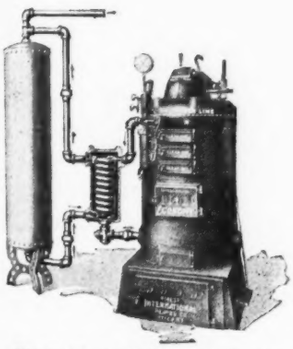
For Hot Air or Hot Water Plants

With the addition of a Fire-Pot Generator to the line of Excelso Water Heaters, you can now specify a better hot water supply in any type furnace or hot water boiler.

The special design of this generator, located entirely above the fire, insures more hot water in less time—easier to install—occupies less space—interferes less with draft and combustion. Two sizes—cast iron or brass.

Fan shape gives More Heating Surface; Baffle Plate better circulation.

For Steam or Vapor Plants



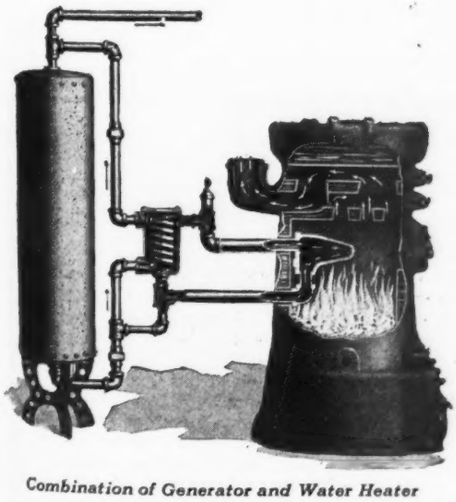
Typical Installation of Excelso Water Heater

Excelso, the original indirect water heater for connection outside of any steam or vapor boiler now in its fourth year of leadership. Easily and quickly installed. Endorsed and sold by all the leading boiler manufacturers.

To Reduce Lime Deposits

A combination of an Excelso Generator with an Excelso Water Heater in hot water or hot air jobs practically eliminates lime because the small volume of water circulating through generator and heater shell always stays the same and becomes neutral chemically. Write for special folder on this subject.

Excelso Water Heater
Patented ground Joints eliminate Leaks. Three Sizes.



Combination of Generator and Water Heater

Write For Selling Helps

Excelso Advertising appears regularly in *Saturday Evening Post, American Magazine, Good Housekeeping.* Plumbers are supplied with free newspaper cuts, booklets, window displays. Write today for full particulars and prices.

EXCELSO SPECIALTY WORKS

117 Clinton St., Buffalo, N. Y.

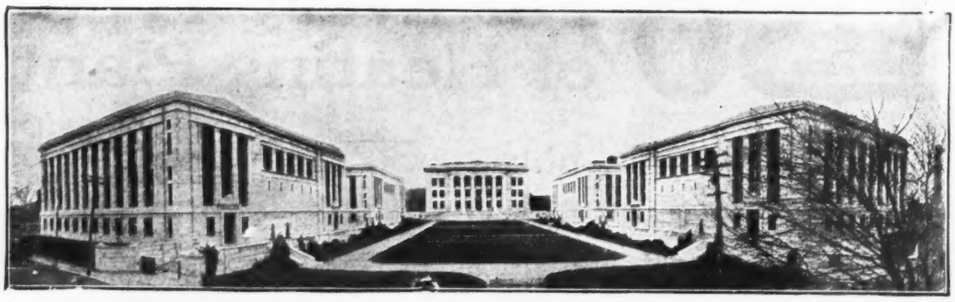
Special New York Representative:
John G. Kelly, 137 East 43rd Street

New England Representative:
Daniel L. Hanson, 46 Cornhill, Boston, Mass.

Geo. E. Kitson Co., 5029 Chester Ave., Philadelphia, Pa.
Western Sales Representative: C. N. Stedman, Wrigley Bldg., Chicago, Ill.

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters



The Harvard University Swimming Pool Is Heated with a WHITLOCK Heater

MOST of the largest and finest buildings and institutions in the country are equipped with WHITLOCK Heaters.

For more than thirty years the name WHITLOCK has stood for the highest type of engineering skill and manufacturing practice.

WHITLOCK Type R Heater is especially adapted for heating water for swimming pools and other requirements where the volume of water circulated is large and the difference between the initial and final temperatures is small.

The use of only the best materials and the superior design of WHITLOCK Heaters make them unusually efficient and durable.

There is a type of WHITLOCK heater to meet your every requirement. Consult us without obligation.

THE WHITLOCK COIL CO., 40 South St., Hartford, Conn.

World's Largest Manufacturers of Service Water Heaters.

NEW YORK CHICAGO BOSTON BUFFALO PHILADELPHIA

WHITLOCK Heaters are manufactured in Canada by Darling Bros., Ltd., Montreal.

WHITLOCK HEATERS

"Have Everlasting Copper Tubes."

The New Metaphram Damper Regulator

We Manufacture

A complete system of apparatus for regulation of temperature and humidity for all types of buildings.

National Tank Regulators for the control of hot and cold water in tanks, reservoirs, drinking water systems, etc.

High and low pressure metaphram boiler regulators.

Expansion valves for the control of gas engines, hot water boilers and condensing coils.

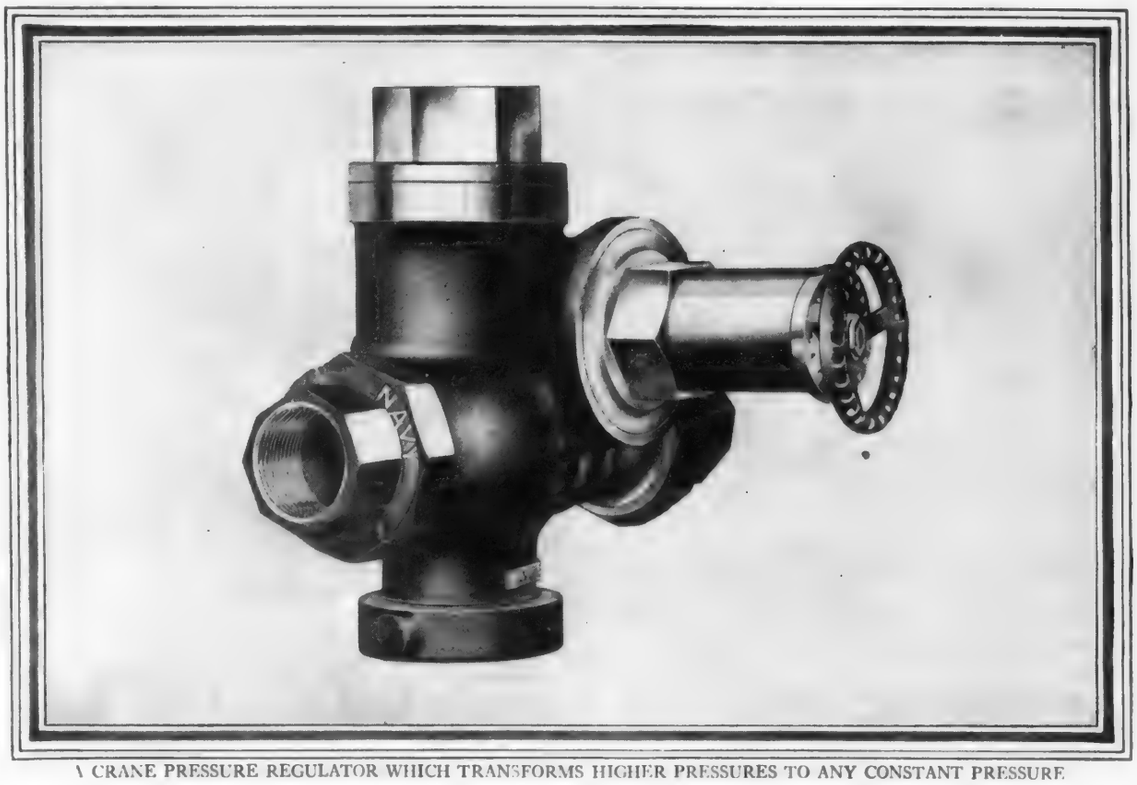
Thermostatic controllers for industrial processes, metal melting pots, annealing ovens, kilns, linotype kettles, cookers, dryers, grain dryers, air washers and humidity control, glue pots, etc.

Reducing valves, gauges, thermometers, hydraulic and electric air compressors.

NATIONAL REGULATOR CO.
FACTORY AND GENERAL OFFICES
208-212 South Jefferson Street
CHICAGO

AS we studied the requirements of present day low-pressure steam, hot water and vapor heating, we saw a need for a Metaphram Damper Regulator that would be best for medium-large house heating boilers at a price below that of our Type C-7" and with a lift and power greater than those of our 4-inch regulators. As a result we designed our Type B-5½ inch, which offers manufacturers and users a most desirable equipment at a lower price. We added a most important feature in our new Offset Fulcrum, which makes it possible to adjust the lift and power of the lever through a simple adjustment of the staggered fulcrum, as is clearly shown in the accompanying illustration. Specifications: We equip this new Type B-5½" with a 40-inch lever, adjustable weights, two ceiling pulleys and 12 feet of No. 0 plumber's chain. Unlike the 4-inch size, this type has a ½-inch female connection instead of male. Shipping weight: 20 pounds.

TRADE METAPHRAM MARK REG U.S. PAT OFFICE



A CRANE PRESSURE REGULATOR WHICH TRANSFORMS HIGHER PRESSURES TO ANY CONSTANT PRESSURE

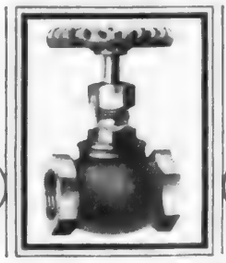
INCREASING THE UTILITY OF A PLANT

Low pressure steam or air delivery direct from higher pressure mains and constant pressure delivery are possible with Crane pressure regulators. Steam at the correct pressure for small power units or low pressure heating, constant pressure steam for process heating and air for blasts, heaters, and low pressure tools can be taken from higher pressure mains through this automatic valve without loss of one bit of heat or energy. Crane pressure regulators are furnished with unions or flanged connections, for any reasonable capacity and working pressure. Let the Crane representative help you to increase the utility of your distribution piping with this dependable money-saving specialty.

CRANE

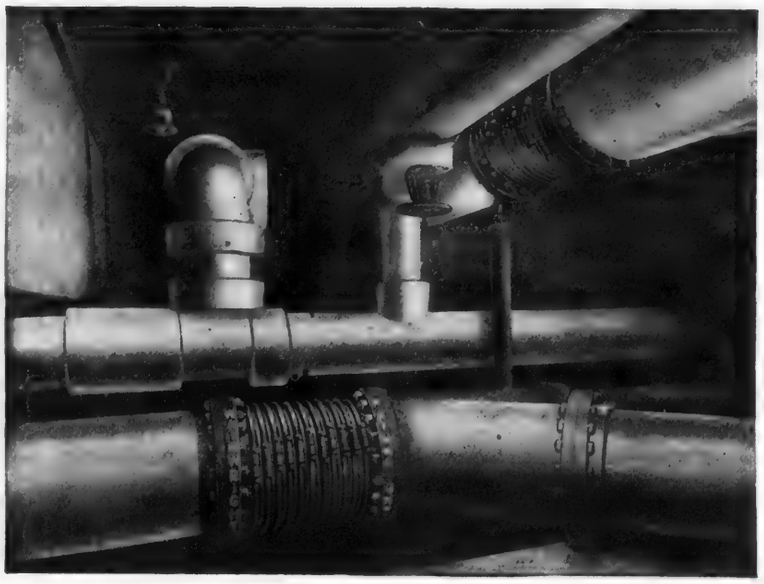
GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVE., CHICAGO

Branches and Sales Offices in One Hundred and Thirty-five Cities
National Exhibit Rooms: Chicago, New York, Atlantic City
Works: Chicago and Bridgeport



Crane 75 Low Pressure Globe Valve

"WAINWRIGHT"
IMPROVED HIGH PRESSURE EXPANSION JOINTS



Wainwright Joints Offer *Maximum Flexibility!*

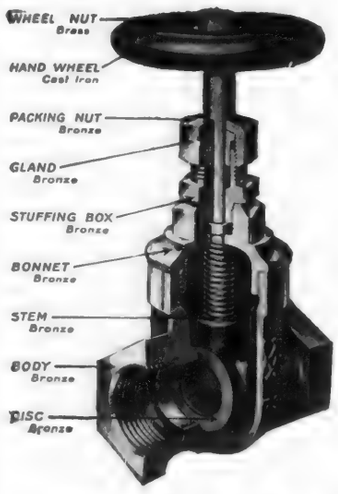
Superior workmanship and a rigid standard in materials used secure repeated orders from old customers. Our Engineering Department is at your service for reports on your proposed installation.

ALBERGER PUMP & CONDENSER COMPANY

140 Cedar Street, New York

Boston Chicago St. Louis Kansas City Philadelphia

What is Your Valve Standard?



Most any valve will work well when new, but it takes a high grade product to stand up for a long period of years and to continue to give one hundred per cent efficient service. That's why engineers and contractors should safeguard the future interests of clients and customers by specifying the KENNEDY. In this way their specification carries with it the protection which the KENNEDY name and KENNEDY guarantee insure to valve users.

KENNEDY

For 44 years, valve satisfaction has been the one object of the KENNEDY organization, and the improvements and developments, which mark all valves bearing their trademark are sufficient proof of the success of their efforts. Special features embodied in the design for the distinct purpose of giving long life include:

Pipe threads of generous length which prevent leakage.
Accurate guides for seat which prevent contact of disc with seat until the valve is ready to close.
Stem of special bronze with high tensile and torsional strength.
Gland in stuffing box which eliminates leaks and avoids frequent repacking.

Other special features of Kennedy Valves are given in our latest catalog. Send for copy and keep it handy. 249

THE KENNEDY VALVE MFG. CO.

Branch Offices and Warehouses
NEW YORK: 95 John St.
SAN FRANCISCO: 23-25 Minna St.
BOSTON: 47 India St.
CHICAGO: 228 N. Jefferson St.

MEMBERS THE NATIONAL TRADE EXTENSION BUREAU OF THE PLUMBING AND HEATING INDUSTRY. PERMIT NO. 7 REGISTERED

SALES OFFICES:
SALT LAKE CITY: 503 Dooley Bldg.
EL PASO: 704 Two Republics Bldg.
SEATTLE: L. C. Smith Bldg.

"How do you balance a hot water job ?"

NO longer is it necessary to use expensive makeshift methods to secure a uniform flow of hot water through every radiator.

With the new "Genuine Detroit" Equalizing Hot-Water Valve, a simple adjustment can be made *after the system is in operation*. And the system may be easily and perfectly balanced.

The cut above shows how simple it is to make this adjustment. A pointer attached to the handle, stops when it reaches the "off" position. A movable stop collar makes it possible to regulate the size of the opening when the valve is turned on.

In this way you can decrease the flow through any valve and equalize the circulation throughout the entire system.

"Genuine Detroit" Equalizing Hot-Water Valves have these other exclusive advantages, too:

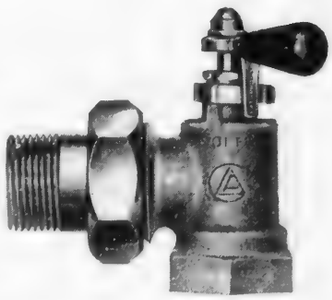
1 The curved inlet plate has less than one-tenth the contact surface of the old type valve. And the scraping edge keeps the contact surface clean so corrosion can't stick the valve.

2 The curved inlet plate makes the water *curve* into the radiator, instead of bumping into the old square cornered turn.

3 The handle is of a new design — non-breakable and non-heat-conducting. It is handsome in appearance with a permanent, black, hard-rubber finish.

Large stock of "Genuine Detroit" Equalizing Hot-Water Valves are maintained at the factory so that you can get immediate delivery.

Your jobber can supply you with these valves and we will be glad to send you a leaflet describing this new invention more fully.



These valves are made in both round handle (No. 104) and lever handle (No. 105) types.

"GENUINE DETROIT"
Hot Water Radiator Valves

DETROIT LUBRICATOR COMPANY

DETROIT, U. S. A.

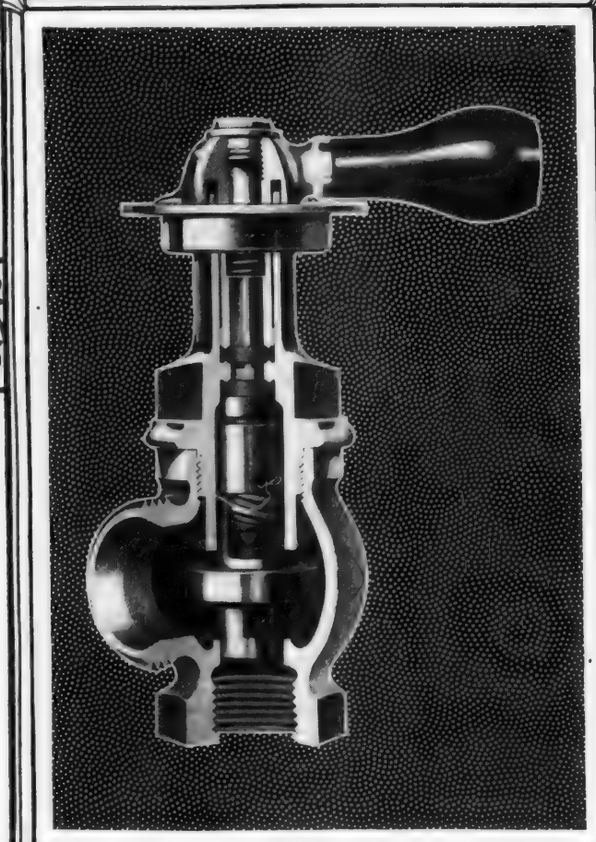
2709 Grand Central Terminal
New York City

1328 Tribune Bldg.
Chicago

1059-65 Monadnock Bldg.
San Francisco

"GENUINE DETROIT"

SHAKE HANDS



YOU can shake hands with your customer every time he regulates the heat. The radiator valve is the most intimate fixture in the entire heating installation and it is the valve which, through daily handling, becomes the most familiar to the owner. To him, this valve represents you. If you have selected the proper valve, each time the heat is regulated you receive a hearty hand clasp.

Lavigne Packless Quick Opening Steam Radiator Valves are the kind of valves which will make friends for you, because they are "Built Right—to Stay Tight." They are manufactured in styles suitable for service on all Vapor, Vacuum, Central Station or Low Pressure Installations.

We also manufacture a complete line of high-grade steam and Hot Water Radiator Valves in all standard sizes and patterns.

Your Jobber Can Supply You

COMMONWEALTH BRASS CORPORATION
DETROIT, MICH.
San Francisco New York Chicago

LAVIGNE

PACKLESS STEAM RADIATOR VALVES

Service and Sales Offices
of
The **Bishop & Babcock Co.**

Amsterdam, N. Y.
F. E. Dwyer
447 Guy Park Ave.

Atlanta, Ga.
D. F. Stevenson
60 W. Mitchell St.

Birmingham, Ala.
R. L. Hicks
216½ N. 21st St.

Boston, Mass.
W. D. Cashin & Co.
35 Hartford St.

Buffalo, N. Y.
M C. Beman, 311 White Bldg.

Charlotte, N. C.
I. Hardeman Co.

Chicago, Ill.
E. Vernon Hill Co.
64 W. Randolph St.

Cincinnati, O.
C. R. Lingo Eng'g. Sales Co.
901 Gerke Bldg.

Cleveland, Ohio
General Offices
1200 E. 55th St.

Dallas, Tex.
Fred Colbert,
1106 Commerce St.

Denver, Colo.
A. G. Reuter
1724 Lawrence St.

Detroit, Mich.
T. R. Woolley
2-133 General Motors Bldg.

Kansas City, Mo.
Engineering Sales Co.
1314 McGee St.

Minneapolis, Minn.
W. P. Nevins Co.
120 S. 9th St.

Nashville, Tenn.
Ryan Sales Co.
922 Stalkman Bldg.

New York City
W. D. Cashin & Co.
5613 Grand Central Term.

Okla. City, Okla.
Federal Steam Spec. Co.
17 N. Dewey St.

Omaha, Nebr.
Omaha Sanitary Sup. Co.
151 Jackson St.

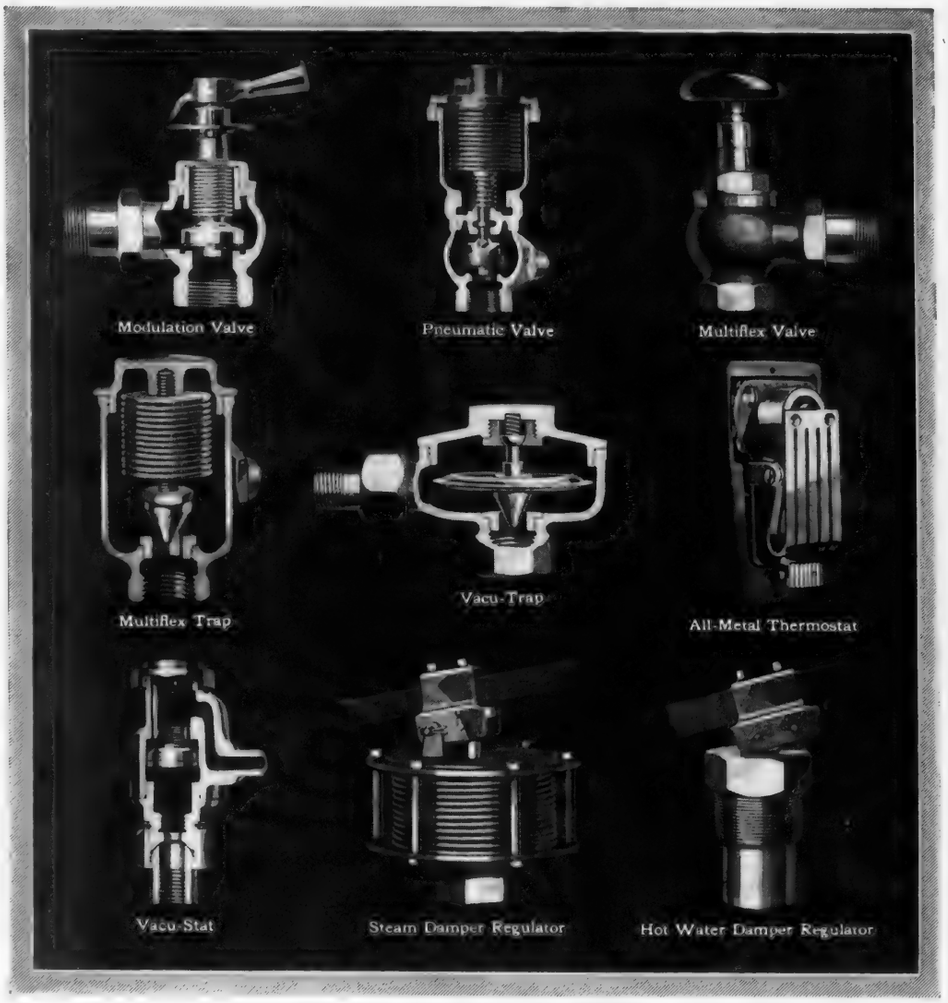
Philadelphia, Pa.
Alexander & McDevitt
30 S. 17th St.

Pittsburgh, Pa.
E. A. Hauschildt,
412 Third Ave.

Richmond, Va.
Virginia Equip. & Sup. Co.

St. Louis, Mo.
P.-K. Engineers
1511 Olive St.

Williamsport, Pa.
E. Keeler Co.



Investigate the B & B Line of Heating Specialties and the B & B Temperature Control System

IMPRESSIVE structures such as the Pennsylvania Hotel in New York and the General Motors Building in Detroit, and a multitude of lesser buildings, apartments and dwellings, are equipped with B. & B. Heating Specialties.

Does not this suggest that behind the B. & B. Line there are technical experience, manufacturing resources and service facilities that may be of value to you?

When you are planning or figuring heating installations, we suggest you get in touch with one of the 23 B. & B. Service and Sales Offices listed in the left-hand column.

You will find this contact both informative and profitable.

It will enable us to explain the merits of the B. & B. Specialties and the B. & B. Temperature Control System, and particularly to point out the advantages of the B. & B. Service-Plan of personal co-operation.

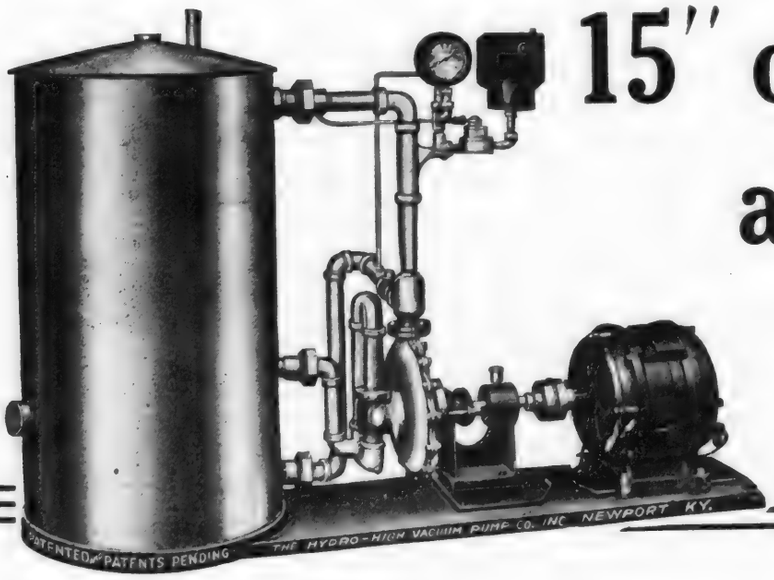
7 BULLETINS have been prepared, illustrating and describing the specialties shown above. Illustrated bulletins are also available on the B. & B. Air Line System of Steam Circulation and the B. & B. Temperature Control System. For printed literature please write the nearest B. & B. office or the general offices, Cleveland, Ohio.

THE BISHOP and BABCOCK CO.

GENERAL OFFICE AND FACTORIES: CLEVELAND, OHIO

The B&B Line—World's Most Complete Line of Heating Specialties

VACU TRAPS MULTIFLEX TRAPS MULTIFLEX VALVES DAMPER REGULATORS VENT TRAPS RADIATOR TRAPS AIR LINE SYSTEM REDUCING VALVES THERMOSTATS PNEUMATIC VALVES



15" of Vacuum at 190° F.

HEATING ENGINEERS who know pumps now say the Hydro answers all objections to the ordinary vacuum pump.

Whether the vacuum required is high or low, the Hydro Automatic Regulator controls this pump perfectly.

Architects, Heating Contractors, Consulting Engineers, Send for Bulletin 100.

CONDENSATION VACUUM
Hydro PUMPS

Factory Representatives, Write for our Special Proposition

The Hydro is the pump that's most economical. It requires little floor space. Simple construction. Fewer wearing parts.

The combination of an automatically controlled centrifugal water pump and vacuum pump impeller in one—that's Hydro.

The Hydro-High Vacuum Pump Co
INCORPORATED
Newport, Kentucky

UNION

CENTRIFUGAL VACUUM PUMP AND BOILER FEED SET

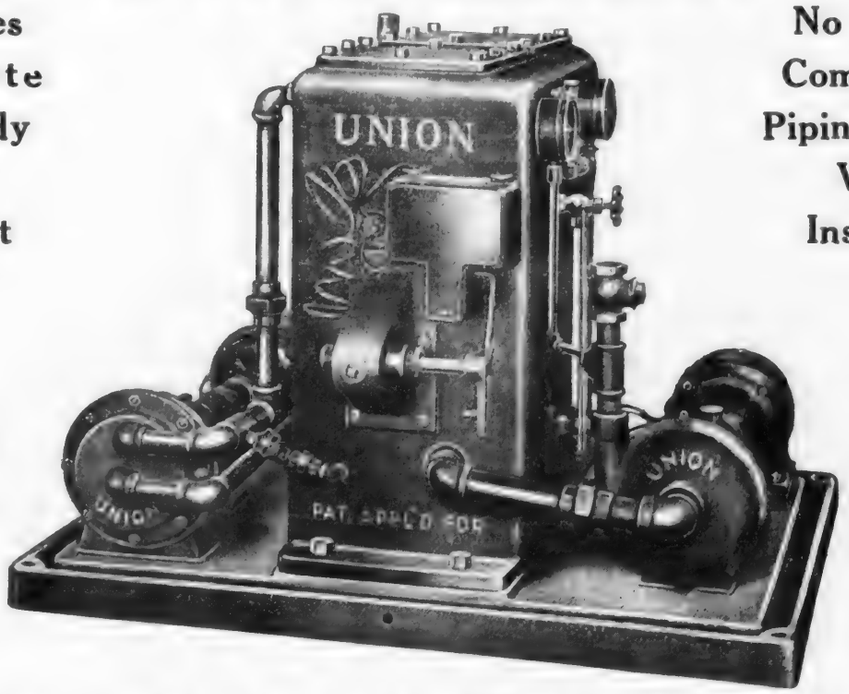
You Have Always Known
Someone Would Do It—and Hoped
It Would Be An Old Reliable
Pump Manufacturer
So It Would Be

Simple — Complete — Reasonably Priced

Here It Is—Assembled From Standard Units
The Way You Have Wanted It

It Comes Complete All Ready To Connect

No Special Complicated Piping to Add When Installing



Vacuum Pump For Any Capacity

Boiler Feeder For Any Pressure

BUILT — SOLD — GUARANTEED STRICTLY ON A VACUUM PUMP BASIS BY

UNION STEAM PUMP CO.

BATTLE CREEK, MICH., U. S. A.

VAPOR MOUAT HEAT

VAPOR MOUAT HEAT

The Good Samaritan Hospital *of* Vincennes, Indiana.

is equipped with the Mouat Vapor Heating System and consequently has positive heat control in each room without the use of vacuum pumps, traps or thermostatic valves.

The story of how this is done is interesting and instructive. Send for it.

Mouat Squires Co., Cleveland, O.

Statler Hotel, Buffalo N.Y.
Archs., Geo. B. Post & Co., New York City
Engrs., Tenney & Ohmes, New York City
Contrs., John W. Danforth Co., Buffalo

Adsco Valves
In the Newest Statler Hotel

FOR safeguarding the health and promoting the comfort of guests, there are being installed in the latest and most modern Statler Hotel, 1474 Adsco Graduated Packless Radiator Valves.

These valves make it invitingly easy for each guest to regulate his room temperature very closely, thus unconsciously saving money for the hotel.

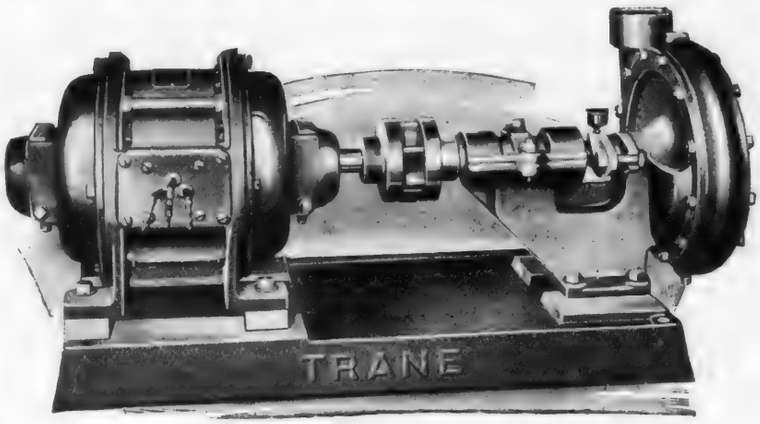
The Valve and other Adsco specialties are sold to the trade at uniform prices—not as part of an engineering specification. We furnish engineering service at a moderate fee, without influence on cost of specialties required.

Write for Bulletins No. 158-H and 159-H, covering "Adsco Heating," and Bulletin No. 20-H, "Community Heating."

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.
OFFICES
New York Chicago Seattle St. Paul Pittsburgh

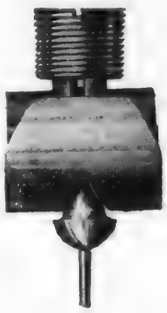
ADSCO HEATING

Circulation Guaranteed



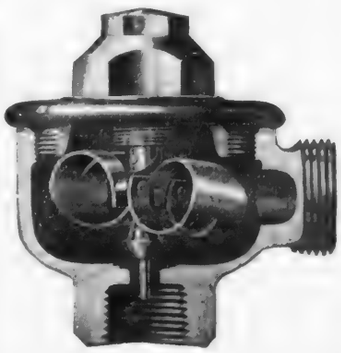
TRANE HEATING SPECIALTIES

Thermetal



The *all* metal element

that is used in Trane Radiator Traps



TRANE SYSTEM VAPOR HEATING
"Heat at the turn of a valve"

10TH EDITION
24 p. 6 x 9 inches

Official Bulletin of Pump Division, Trane Engineering Department. Practical data and engineering information on condensation, circulating and all similar pumps. Free to contractors, engineers and architects

Trane Circulating Pumps are used for air washers, swimming pools, forced hot water heating, circulating cold and hot water to fixtures, for drinking water purposes, water supply, booster pumps, boiler feed pumps, circulation of brine and other liquids, and for kindred uses.

Each unit consists of a brass or iron fitted pump, including closed or open impeller, together with cast iron base and motor of proper size and characteristics. Standard pumps for water supply service are brass fitted and have enclosed impeller.

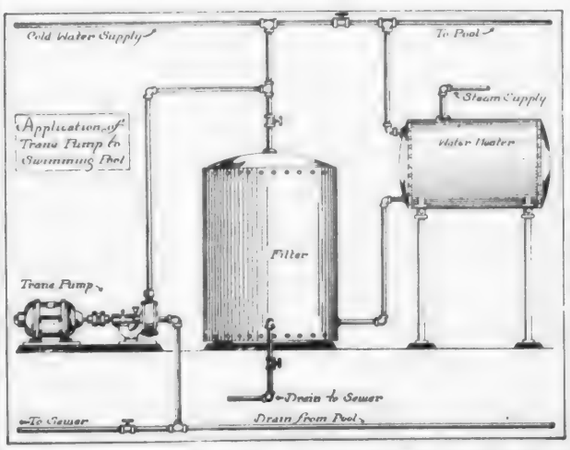
When you think of pumps, think of Trane.

The Trane Company

La Crosse, Wis.

206 CAMERON AVENUE

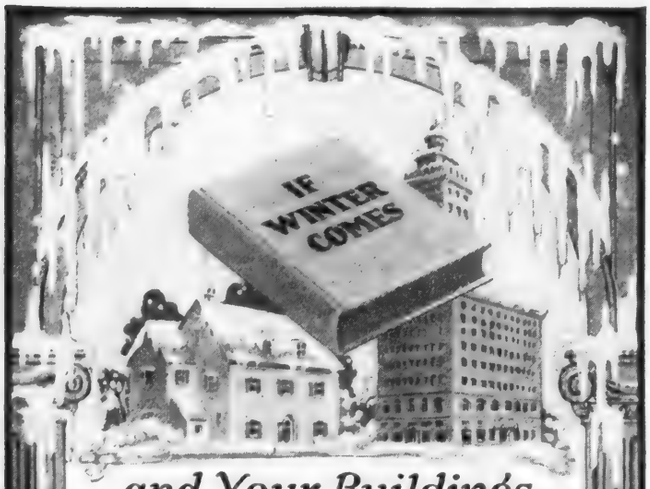
Chicago, New York, Boston, Philadelphia, Buffalo, Detroit, Cleveland, Salt Lake City, Portland, Ore., Knoxville, Greensboro, N. C.



APPLICATION OF TRANE PUMP TO SWIMMING POOL

Sufficient pump capacity should be provided to circulate all of the water in the pool in about 24 hours.

TRANE PUMPS



and Your Buildings are Equipped with

ILLINOIS HEATING SYSTEMS

All's Well

Illinois Vapor Systems are positive and rapid in circulation, and the temperature of each room is within easy control of the occupant, as only a half turn of the Supply Valve is required from full steam to shut off.

With these desirable results, ***Illinois Systems*** combine some features which effect an exclusive fuel economy—Our Bulletin No. 20 describes this apparatus. Sent upon request.

To specify an
ILLINOIS HEATING SYSTEM
is to give your client a Guarantee Policy on satisfaction and fuel economy.

GIFFORD PRODUCTS

ILLINOIS
ENGINEERING COMPANY
INCORPORATED 1900
CHICAGO
REPRESENTATIVES IN 26 CITIES

A Strainer and Trap—

at Price of One!

Why go to the expense of installing strainers when you can get both a strainer and a trap in the Sarco? This 2 in 1 construction makes the Sarco the cheapest Radiator Trap on the market. The strainer protects the seat from damage by foreign substances and lengthens the life of the trap.

Tne Sarco can be shipped without the elements so that when operating as a gravity system all the scale and dirt will be washed out. The elements can then be easily dropped into place and the trap will function perfectly on vacuum or on pressures up to 20 lbs. That saves money when installing.

Not being attached to the body or cap, the elements can be quickly lifted out and replaced at any time without affecting the adjustment.

Another thing, the brass castings of the Sarco are absolutely free from blow holes or other defects and are exceptionally heavy. No danger of cracking or straining the trap when connecting the same. Won't air-bind or waterhammer.

Other important advantages explained in our booklet P-109. Write for a copy.

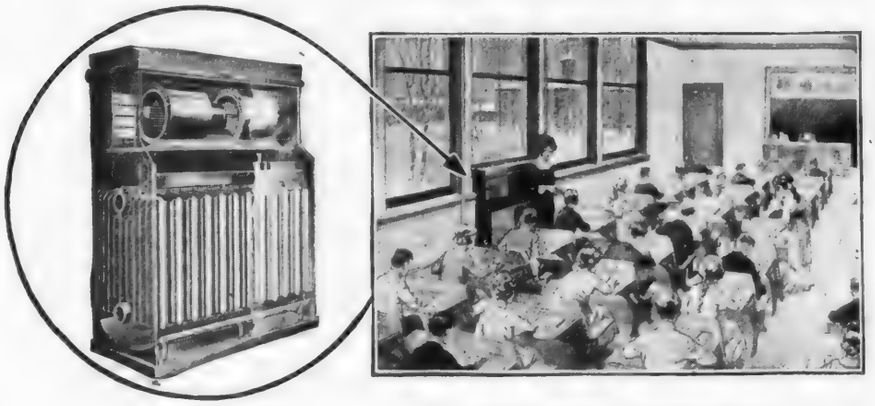
SARCO Co., Inc.

231 Broadway, New York City
BUFFALO CHICAGO CLEVELAND DETROIT PHILADELPHIA

RADIATOR TRAP
SARCO

UNIVENT

"LIVE OUTDOORS-INDOORS"
(TRADE MARK)



Phantom view *Fresh heated air from the window*

What the Jamestown and other school boards found out about the Univent

In 1914 the Board of Education of Jamestown, New York, made a thorough study of ventilating systems. As a result they approved and accepted the Univent idea for ventilating a school.

They did this because the Univent permitted each and every room to be ventilated independently of any other room. Instead of a system of long, uncleanable ducts and flues, each Univent took fresh air directly from outdoors, heated it, and thoroughly diffused it throughout the rooms.

This was their ideal of perfect ventilation—as simple and more positive than opening the windows—but without cold, dangerous drafts.

They found the absence of ducts saved space, lowered building costs and assured each room of its own individual supply of fresh air. When only one room was being used, only the Univent in that room was used. This saved operating cost. So, in 1920, when a big school building program was decided upon, the Jamestown School Board installed the Univent system in five more large schools.

In 1913, Utica, New York, tried out the Univent. Today nine schools in Utica are Univentilated.

School authorities, everywhere, from New York to California say the Univent makes class room air as fresh as outdoors. This perfect ventilation increases mental alertness and decreases sick leave.

The Univent system is the simplest system to install. It is more profitable for the contractor. No adjustment of dampers (which never stay adjusted) are necessary, yet distribution of air is always perfect. There is a lot of business in store for you in specifying and equipping the old schools in your vicinity with the Univent system.

As a Heating and Ventilating Engineer—*You should know all about the Univent system. Send for a copy of our special 72-page Engineer's edition "Univent Ventilation." Please use your business letterhead*

THE HERMAN NELSON CORPORATION, Dept. H1, *Moline,* Illinois

What You Have Wanted!

A SINGLE PIPE VAPOR SYSTEM

Simple to Install

—Any steam fitter can lay out ths System

Low in Cost

—Get our figures

It Does the Work

—We have the successful installations to prove it

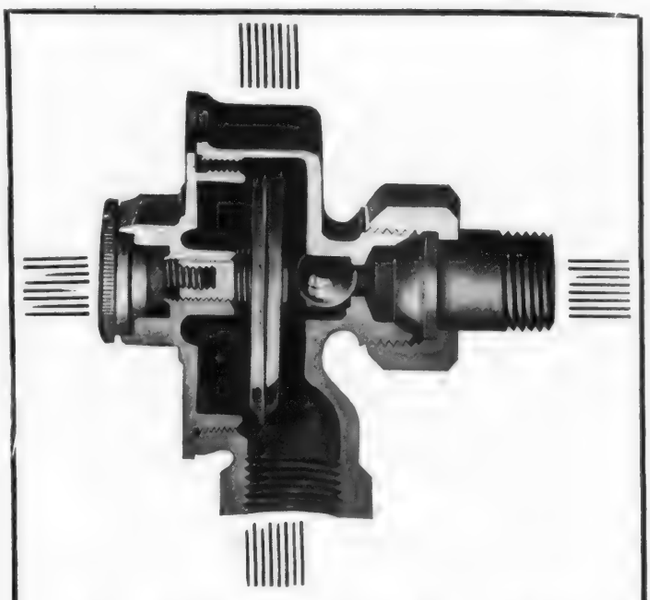
Descriptive matter sent on request

GORTON & LIDGERWOOD CO.

96 Liberty Street

NEW YORK

FISHER BUILDING, CHICAGO, ILL.



A high grade thermostatic return trap

with the non-corrosive ball check feature

How it operates:

The non-corrosive ball-check operates on a smooth guide or track, and is rolled to its seat against vapor or steam by the expansion of gas in the thermal member. When the radiator supply valves are closed, condensation of the steam forms a vacuum in the radiators which holds the balls to their seats, permitting all water in the return lines to flow freely back to the boiler, thereby eliminating the danger of broken boiler sections and preventing steam or vapor short-circuiting into radiators through return risers.

Boiler Insurance

The O-E Combination Ball-Check Trap is the only trap made with the check feature, and it costs no more than an ordinary return trap. Engineers and Architects will specify "O-E" No. 2 as insurance against boiler damage, this insurance alone being worth more than the reasonable price asked.

O-E Specialty Manufacturing Co.

Manufacturers of the

Celebrated "O-E 3-in-1" Heating Specialties

MILWAUKEE, WISCONSIN

TO INSURE MAXIMUM VENTILATION AT A MINIMUM EXPENSE?

This is a question which is now confronting a large number of School Boards, and which may cause them many hours of worry and regret, not only before they select the type of System, but after same has been installed.

BUCKEYE HEATOVENTS, the ideal Heating and Ventilating Units, will solve the problem, prevent worry, and leave no regrets, as they insure the best of ventilation at the lowest known cost.

In fact, Buckeye Heatovents will save as much as thirty (30) per cent on your ventilation cost, as compared with any other type of ventilating system.

We are in position to make quick shipment of any number of Heatovents, so that you can have them ready for the coming cold months.

Our Engineering and Service Departments are ready to assist or cooperate with any Engineer or Architect by furnishing proper data and information for designing the Unit system for Banks, Offices, Clubs, Lodges, Schools, Churches, Auditoriums, Gymnasiums, etc., without any obligation.

BUCKEYE BLOWER CO.

COLUMBUS, OHIO

BRANCH SALES AND ENGINEERING OFFICES

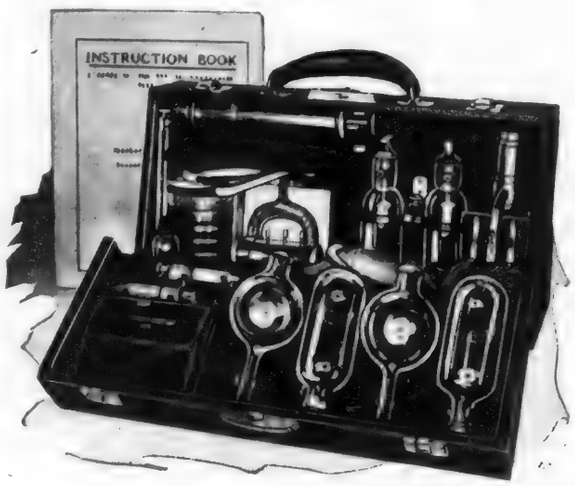
BUCKEYE BLOWER CO.
324 Monadnock Bldg.
Chicago, Ill.

BUCKEYE BLOWER CO.
503 Wabash Bldg.
Pittsburgh, Pa.

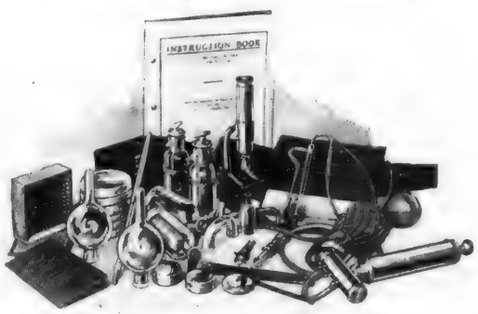
BUCKEYE BLOWER CO.
1400 Broadway
New York, N. Y.

BUCKEYE BLOWER CO.
372 Whitehall St.
Atlanta, Ga.

TRADE TEL TRU MARK



The Case now contains the following instruments



1	Dr. Hill Dust Counter complete now recognized as the only practical method of determining the dust content of the air	$85.00
1	Folding Microscope	35.00
6	Petrie Dishes	3.00
1	Odorometer	6.00
1	Amonium-Chloride Machine for studying air currents and determining air motion.	18.50
1	Air Pump (rubber) for collecting air samples	2 50
1	Cotometer a new device for analyzing air for CO_2 in the field.	50.00
1	Kopnaerimeter a very accurate instrument for determining air velocity. It has no moving parts.	16.50
1	Whirling Psychrometer	12.00
1	Lufkin Pocket Steel Tape	1.50
1	Psychrometer Chart	.25
1	Book of instructions	2.50
1	Serviceable carrying case, covered with genuine cowhide leather, heavy brass nickel plated fittings, snaps, lock and key	15.00
	Total if purchased separately	$247.75

The above instruments purchased in the case complete $175.00, F. O. B. Chicago. All instruments sold separately if desired.

Men who can not Afford to Guess

CONSULTING ENGINEERS, SCHOOL ENGINEERS HEALTH OFFICIALS, and ARCHITECTS find our complete AIR-TEST CASE indispensable.

It is also a necessary part of the teaching equipment of all Technical Schools where ventilation and air conditioning are part of the curriculum.

The case has been redesigned and many of the instruments improved. Also three important new instruments added, namely: the Cotometer, for the simple and accurate determination of CO_2; the Kopnaerimeter for measuring air velocity; and the Whirling Psychrometer.

The heating season is at hand and ventilation problems in the schools, offices and factories now present themselves. Scientific methods and instruments are necessary for their solution.

E. VERNON HILL COMPANY, *Aerologists*
64 W. Randolph Street, Chicago, Illinois.

TEL TRU TEL TRU

ALLEN AIR-TURBINE VENTILATOR

Standard of Ventilating Efficiency

Wherever ventilation is desired—in factories, foundries, stores, schools, hotels, churches, theatres, residences, kitchens, bakeries, tanneries, barns, stables, garages, chimneys, air shafts, or wherever air circulation is required, Allen Air-Turbines *have proven the best, cheapest and most efficient* ventilating system known.

Many of America's largest architects, engineers and industrial concerns have adopted and endorse Allen Air-Turbine Ventilators.

Patented

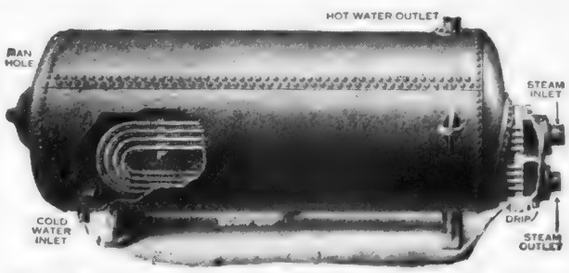
Our air displacement is measurable and the figures given are guaranteed to be correct.

Diameter of Pipe	Air Displacement Cu. Ft. per Hour	
	Wind Velocity 4 Miles per Hour	Wind Velocity 8 Miles per Hour
8 Inches	17,300	21,600
10 "	26,500	32,500
12 "	38,600	46,200
15 "	54,000	69,000
18 "	85,200	102,100
20 "	105,100	125,600
24 "	149,000	185,000
30 "	225,000	272,000
36 "	281,000	330,000
42 "	324,000	414,000
48 "	360,000	473,000

CARRIES OFF
GASES
MOISTURE
STEAM
SMOKE
VAPOR
FOUL AIR
ODORS
HEAT
FUMES
DUST
DAMPNESS

Write for Detailed Literature

ALLEN AIR-TURBINE VENTILATOR CO.
DETROIT Eighth and Porter Sts. **MICHIGAN**



The Patterson Combined Hot Water Service and Storage Heater.

The proper "balance" between the storage & heating capacities

in any heater is necessary to secure satisfactory service.

If this necessarily important feature is overlooked or not properly provided for when the heater is designed, it will neither be satisfactory to the purchaser nor operate efficiently.

Our long experience in designing and constructing Hot Water Service Heaters—for all domestic and industrial purposes—is offered to Heating, Ventilating and Sanitary Engineers.

It implies no obligation to consult with us.

Patterson-Kelley Co. 107 East 40th St. **New York**

Dependable and economical warmth

THE inventor and foremost developer of heavier-than-air flying machines was also known for his keen knowledge in other engineering lines and his insistent desire for the best of everything mechanical.

Throughout the home built for Orville Wright, the equipment is therefore of the best, and so the choice of a Webster System of Steam Heating was logical, because of its unequalled record for convenience and dependable warmth.

Thousands of installations in every type and size of building are demonstrating the entire satisfaction obtained with Webster Systems of Steam Heating year after year.

Thirty-four Webster Branch Offices and Service Stations covering all parts of the country cooperate to the fullest extent with architects, engineers, contractors, and owners and give them all the benefits of our 33 years of experience.

May we send you bulletins?

Warren Webster and Company

Main Office and Works, Camden, N. J.

Branch Offices In All Principal Cities

Webster

MODULATION SYSTEM OF STEAM HEATING
VACUUM SYSTEM OF STEAM HEATING
STEAM AND OIL SEPARATORS
FEED WATER HEATERS
STEAM SPECIALTIES

32

Thos. Hoye, Htg. Cont.

McALEAR

Radiator Traps

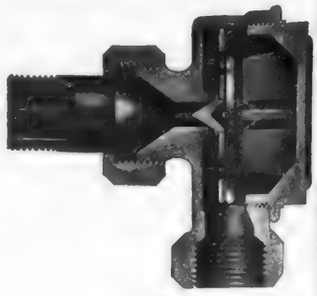
are noted for their
Efficiency
Economy
Simplicity
Accessibility
Long-Life

and are
Non-Adjustable
Positive in Action
Noiseless in Operation

Milwaukee Athletic Club, Milwaukee, Wis.

Completely Equipped
McAlear Radiator Traps
McAlear Steam Specialties

Ask for Literature



No. 28 Trap

McALEAR MFG. CO.
CHICAGO

THE HEATING AND VENTILATING MAGAZINE

VOL. XIX. NO. 11

CONTENTS FOR NOVEMBER, 1922

Experiments in Air Conditioning of Separate Rooms 29
Humidifying and Dehumidifying Tests Which Show Usefulness of Portable Air Washers in Offices and Homes.

Mechanical Equipment for a Large Mesaba Range School 32
Northwestern Practice Illustrated in the Remarkable Plant Installed in the Vocational High School at Virginia, Minn.

Improving Air Conditions in a Chicago Bank Building ..... *E. Vernon Hill* 37
How Tests Disclosed the Faults in the Ventilating System and Suggested the Remedy.

Heating a Building by Friction 41

Service Department 43
An Arrangement for Automatically Lowering the Temperature of Idle Railway Cars.

New York State Commission on Ventilation Publishes its Report 45

Correspondence 46
A Study in Department Store Ventilation.
Practice of Pittsburgh Bureau of Smoke Regulation.
The Smokeless Boiler Discussion.

Oil-Burning in High-Pressure Boilers 47

Shale Oil 49

Chats with Uncle Ben 50
The Chimney that Smoked.

American Society of Heating and Ventilating Engineers 51
Annual Meeting to be Held in Washington.
Nominations of Officers for 1923.
New Chairman of Guide Publication Committee.
Chapter Meetings.

Directions Issued by Bureau of Mines for Burning Soft Coal in House-Heating Boilers 52

Rules Issued by Province of Alberta for Burning Soft Coal 52

Impressions of the Recent Gas Convention 54
Industry Giving Serious Attention to House-Heating by Gas as the Next Forward Step in the Development of Household Utilities.

Legal Decisions 55
Valuation of Heating Plant for Rate Making.
Steam Heat as a By-Product.

Portable Unit Ventilators 56

Novel Applications of Electric Heaters ..... *T. W. Reynolds* 57

National Trade Extension Bureau 60
The Common Cause.
Heating Possbilities.
A Four-Hour Day.

Types of Fuel-Oil Burners for Household Use 60
III—Ray Rotary Fuel Oil Burners.

New York State Heating Contractors in Annual Convention 64

Heating and Ventilating Data Sheets 70
No. 13-Y—Radiation Computing—Water Heating 18-In. Stone or Concrete Wall.
No. 13-Z—Radiation Computing—Water Heating—20-In. Stone or Concrete Wall.
No. 13-AA—Radiaton Computing—Water Heating—24-In. Stone or Concrete Wall.
No. 13-BB—Radiation Computing—Water Heating—Single Windows.

Advertisers' Index, Page 106.

Engineers' Specification Index, Page 100.

YEARLY SUBSCRIPTION $2.00 **SINGLE COPIES, 20 CENTS**

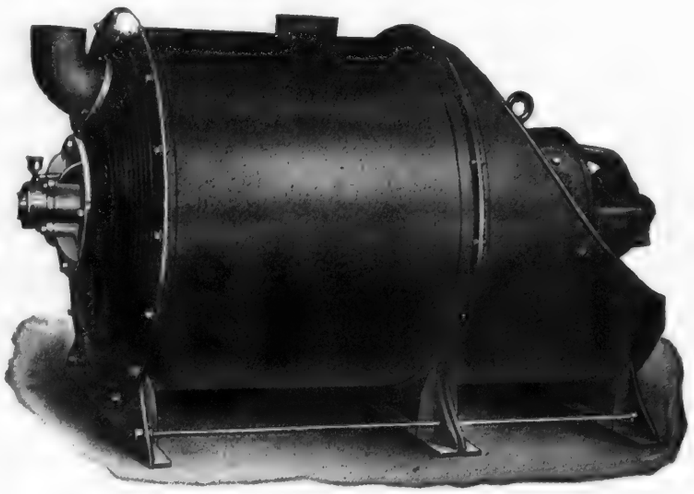
Published monthly at Cooperstown, N. Y., by the Heating and Ventilating Magazine Co.
Executive and Editorial Offices 1123 Broadway, New York

Entered as second-class matter at the Post Office in Cooperstown, N. Y.
Copyright, 1922, by The Heating and Ventilating Magazine Co.

Send for list of references of school installations and complete data regarding the Spencer equipment.

Spencer Turbine

Cleaning Systems



Horizontal slow speed Spencer Turbine vacuum cleaning exhauster. Direct motor driven, wide clearance, multistage type equipment.

particularly developed for the cleaning of school buildings in a sanitary manner without spreading dust in the air, and giving the most thorough and rapid cleaning for school buildings.

Spencer systems are chosen by those who have had the most experience with vacuum cleaning apparatus in school buildings.

THE SPENCER TURBINE COMPANY
Hartford, Conn.

JSC

The word *service* in this company's name applies to the installation of the Johnson Pneumatic System of Temperature Regulation by no one other than the Johnson Service Company. It implies the efficient performance of the apparatus following installation. It includes the company's guarantee of attentive interest in the installed apparatus as long as it exists. It embraces the superior benefits derived from The Johnson System, in its various applications: alone unequally advantageous, and especially so with the foregoing comprehensive elements of strict supervision. *Service*, indeed.

The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

NOVEMBER, 1922

Experiments in Air Conditioning of Separate Rooms

Humidifying and Dehumidifying Tests Which Show Usefulness of Portable Air Washers in Offices and Homes

CONDITIONING the air in separate rooms through the use of portable air washers is a development which has many alluring possibilities. Some recent work in this direction has recently been carried out as a class exercise in the course in ventilation in the School of Public Health of the Harvard Medical School. The results are reported by Philip Drinker, B. S., Ch. E., who is in charge of the course, and R. M. Thomson, in *The Journal of Industrial Hygiene*, published by the Harvard Medical School.

Use was made of a White portable air conditioning machine, manufactured by the National Air Treating Company. It consists of a metal tank 2 ft. x 2 ft. x 14 in., above which is mounted a 1/6 H. P. Holtzer-Cabot direct-current shunt motor driving, through bevel gears, a special centrifugal pump and shaft perforated with holes for throwing the water from the pump out in a fine spray into the spray chamber.

In the machine used for demonstrating, the spray chamber walls are made of glass. The air enters this chamber through a series of closely-spaced herring-bone baffles, through which the water is returned to the tank. The exit air is freed from entrained water by passing through a like series of baffles to the 1500 cu. ft. per minute exhausting fan. This fan is driven by a 1/12-H. P. Holtzer-Cabot direct-current shunt motor. Both motors run at 1760 R. P. M., 115 volts, while the pump motor is rated at 1.2 amperes and the fan motor at 1 ampere.

The motors are connected in parallel and are designed for constant speed, so that starting the machine consists in merely plugging into a standard socket.

The only instrument on the machine for temperature measurement is a thermometer on the pump line to show the temperature of the water entering the spray chamber. This, it is stated, is really all that is needed.

ALL TESTS RUN IN SAME ROOM.

All of the tests reported by Messrs. Drinker and Thomson were run in the same room, which was selected without any particular regard to general thermal conditions, position of ventilators, radiators or windows. The radiator was shut off for all runs, and heat was supplied on Test 4 only from a gas furnace across the top of which air was blown by an electrically-driven fan. This fan was kept in place and run at the same speed for all tests.

The fan and air conditioning machine were so placed as to cause the minimum of air currents, and both were run at full speed at all times. All instruments were read from the same position relative to the fan furnace and air conditioning machine. The ventilators were blocked off and no external source of ventilation was used. The doors were kept locked. Four men were present in Tests 1 and 4, and five men for Tests 2 and 3.

OUTDOOR TEMPERATURE BELOW FREEZING.

The outdoor temperature was well below freezing both days these tests were run, and a large window, 6 ft. by 8 ft., gave abundant space for condensation during the "humidifying" tests. No attempt was made to obviate this.

For the last three tests, an ejector was used for both emptying and filling the tank of the White machine, so that not more than five to ten minutes elapsed between stopping one run and starting the next. In all cases the water level of the tank was kept at as nearly 11 in. as possible. This was equivalent to 4.56 cu. ft., or 20.39 lbs. of water per inch.

No tests were made with the tank water at a relatively high and constant temperature, nor were any tests made with a dehumidifying agent at temperatures below 32° F.

RELATIVE HUMIDITY.

Relative humidity was determined with a Tycos sling psychrometer of the U. S. Weather Bureau type, and checked with a portable motor-fan psychrometer and a hair psychrometer, designated a "sling," "motor" and "hair," respectively. The sensitivity of the last instrument was surprising, in view of the wide range of conditions prevailing.

The relative humidity of the moist air delivered from the White machine is not shown on the curves, although wet and dry-bulb readings are given in the tabulated results. Regardless of conditions in the room, this exit air is saturated to such a high degree that its determination by wet and dry-bulb is difficult and unreliable. It was found impossible to keep the dry-bulb dry for more than a few seconds at a time, although water lost by entrainment appeared to be low.

The manufacturers claim a relative humidity of over 90% for this exit air, which appears to be a conservative estimate, while a variation of a few per cent either way would have little effect on the rapidity with which the desired atmospheric conditions can be obtained.

For both the exit air from the machine and the room air the dry-bulb readings are shown on the curves. For the room air the dry-bulb readings of the sling and motor-fan psychrometer are averaged.

Readings were taken with a long-stemmed thermometer, the water being thoroughly stirred before each reading. It was found that these readings for run 1 checked those of the thermometer (provided by the manufacturers) in the water intake of the machine so closely that reading of the latter was dispensed with, since the machine was so placed for our tests as to make this reading inconvenient.

COOLING POWER OF THE AIR.

Hill's wet and dry katathermometer, (described and illustrated in recent issues of THE HEATING AND VENTILATING MAGAZINE) was used for determining the cooling power of the air with reference to body temperature.

Although at first glance the figures and curves of the kata-thermometers readings, as given herewith, appear to cover a rather wide range without special relation to each other, it will be seen that they show maximal and minimal points at about the same times, which, in turn, bear a definite relation to the humidity readings.

For locations in which the comfort or hygienic aspects of humidity and temperature are the important consideration, the katathermometer is useful in connection with wet and dry-bulb readings, while for problems of air drying at atmospheric or even reduced pressures the kata-thermometer affords information obtainable with the wet and dry-bulb psychrometer only by considering the total heat in the air.

TEST 1—TIME REQUIRED TO HUMIDIFY ROOM WITH WATER AT MEDIUM TEMPERATURE.

In the first test it was desired to find how quickly and to what extent the room could be humidified when using water at an initial temperature of only 160° F. When the motors were started the relative humidity was 55%, and was raised to 77% in ten minutes. The preliminary rise in humidity during the first twelve minutes was due to evaporation from the tank water, as a small hose was used in this run. It will be seen from the curves and data of this test that there is a gradual falling off in humidity after the maximum point is reached, and that this drop in humidity accompanies the drop in temperature of the tank water. The kata-thermometers both show a rise in cooling power as the humidity decreases.

TEST 2—TIME REQUIRED TO SECURE HIGH HUMIDIFICATION.

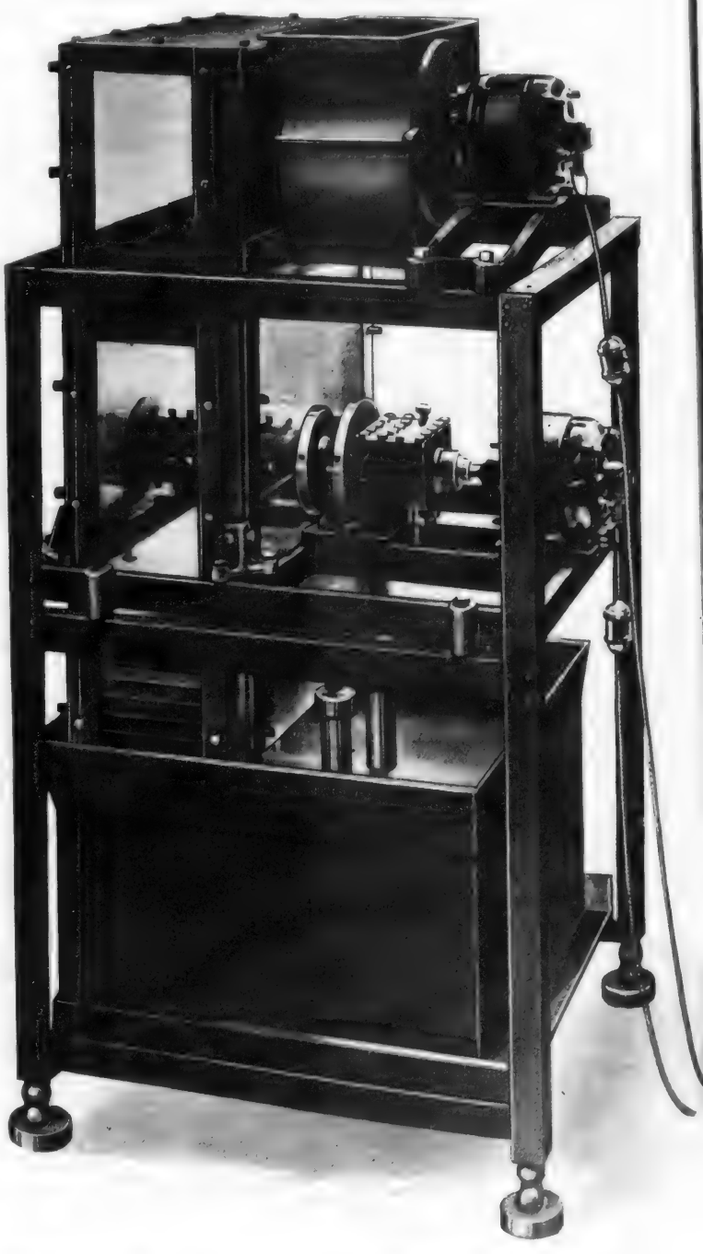
The rapidity with which a high degree of humidity can be reached is well shown in this test. With an initial humidity of 26½%, a maximum of 91% was reached in ten minutes, with a rise in room temperature of only 9°. This figure could have been maintained by keeping the temperature of the tank water high enough to reach a predetermined equilibrium. A consideration of the curves of this test show that the speed of humidification is greater than in Test 1, owing to the higher initial temperature of the tank water. This is most clearly shown by superimposing the curves of Test 2 on those of Test 1.

TEST 3.—TIME REQUIRED TO DEHUMIDIFY ROOM.

Using ordinary tap water in the tank of the White machine, it was desired to see how quickly and to what extent the room could be brought to ordinary conditions. Test 3 was accordingly started with a relative humidity of 72%, and the tank water at 48° F. Dehumidification occurred slowly but with regularity until the tank water reached 59° F., at which point equilibrium was gradually being reached.

TEST 4.—TREATMENT OF HOT AND HUMID CONDITIONS.

For use during hot and humid summer days, a machine of this type is called upon to reduce humidity and to keep it at a predetermined figure. To exaggerate conditions prevailing on disagreeable and uncomfortable summer days, the relative humidity of the room was rapidly raised by running the machine for a few minutes with hot water, then emptying it quickly, and refilling with cold water and snow. This mixture gave a tank temperature of 32° F., which was maintained for the first sixty minutes of the test by continually adding snow and withdrawing water. The run was started as soon as a temperature of 32° F. was reached in the tank, and at the same time the gas furnace was lighted and regulated to keep the temperature of the room is nearly constant as possible. Without some source of heat, it is impossible to dehumidify rapidly and at the same time keep up the room temperature to



WHITE PORTABLE AIR CONDITIONING MACHINE USED IN TESTS.

ordinary conditions. The rate of dehumidification is best shown by superimposing the steeper curves of this test on the more gradual ones of Test 3. In order to observe the rise in relative humidity after the equilibrium point was approximately reached, the tank temperature was allowed to increase, and at the same time the gas furnace was turned down lower.

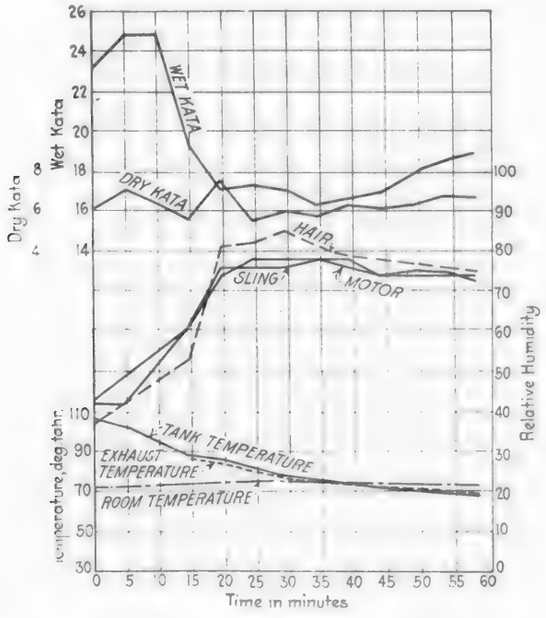


FIG. 1.—TEST 1, HUMIDIFYING.

Tank water at initial temperature of 106° F. No attempt to humidify quickly.

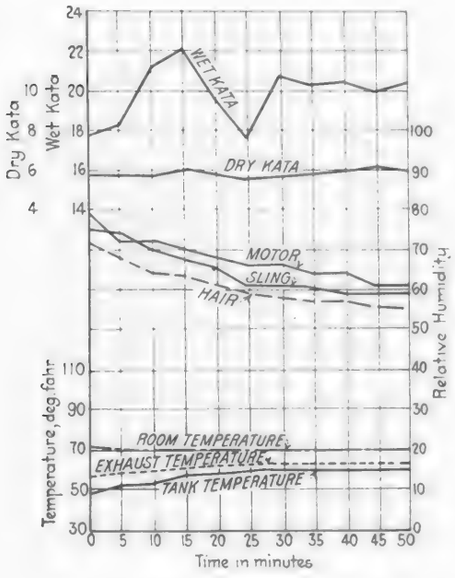


FIG. 3.—TEST 3, DEHUMIDIFYING.

Tank water at initial temperature of 48° F. Ordinary tap water used. Test stopped on reaching approximate equilibrium.

SUMMARY.

From these tests it will be seen that a portable air conditioning machine is well adapted to demonstrations and study of variations in relative humidity and temperature. Experimental demonstrations such as these, in which students take part, can easily be amplified to include physiological studies on the effect of temperature, humidity, carbon dioxide, etc.

Ventilation Code To Undergo Revision

An announcement by the Special Committee on Approval of Ventilation Code, of the Federated American Engineering Societies, states that in view of the fact that the American Society of Heating and Ventilating Engineers is planning to revise the code during the coming year, in order to include important developments on the subject and particularly the results of work on ventilation now in progress by the society, the code has been referred back to the society "in order that a revision at the hands of a thoroughly representative sectional committee shall insure its acceptability to all interested bodies."

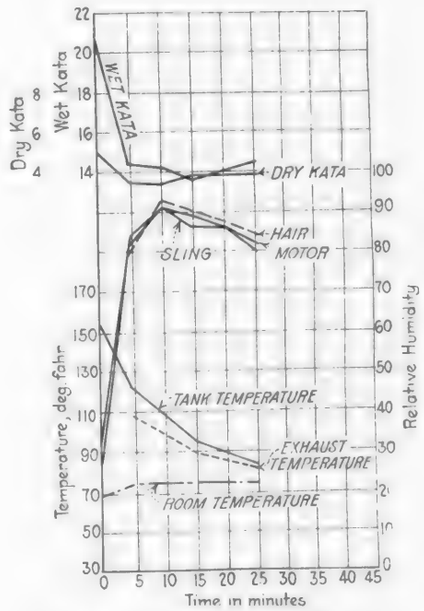


FIG. 2.—TEST 2, HUMIDIFYING.

Tank water at initial temperature of 154° F. Humidifying quickly and allowing tank temperature to fall until approximate equilibrium was reached.

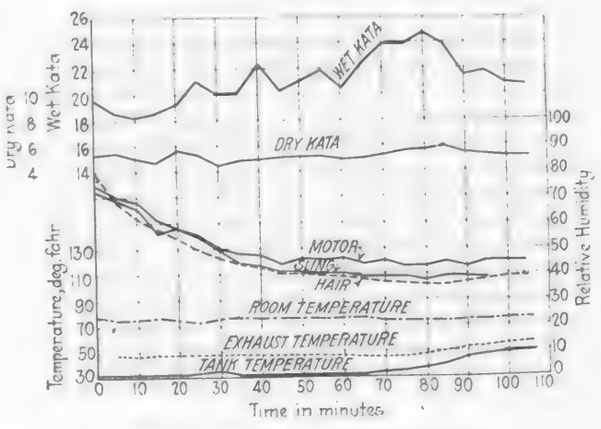


FIG. 4—TEST 4, DEHUMIDIFYING.

Tank water kept at 32° F. for 60 minutes, then allowed to rise to show corresponding rise in relative humidity. Note that exhaust temperature and relative humidity do not rise for some minutes later.

VOCATIONAL HIGH SCHOOL, VIRGINIA, MINN.

Mechanical Equipment for a Large Mesaba Iron Range School

Northwestern Practice Illustrated in the Remarkable Plant Installed in the Vocational High School at Virginia, Minn.

VIRGINIA, Minnesota, in the heart of the Mesaba Iron Range, is one of the largest of a series of thriving cities and villages which have grown up in a wholly undeveloped area since the formation of the United States Steel Corporation in 1901. The mining companies early realized that in order to draw people from other developed and settled points it would be necessary to build towns fully equipped with schools, hospitals, and all other modern conveniences. To-day these towns are quite thickly populated and are thoroughly up-to-date in all respects. Some twenty-five or thirty languages are spoken in the different communities and yet it would be hard to find a more contented population in any locality, and this is largely due to the fact that no expense was spared to Americanize the alien element as rapidly as possible through the development of good moral and sanitary conditions, and highly developed school systems.

The latest and largest school to be completed on the Mesaba Range is the Vocational High School at Virginia, Minnesota. This magnificent school, completely modern and fully equipped to the last detail, was erected under more than the average number of difficulties confronting the school board, architect, engineer, and contractors. These difficulties, too numerous to mention here in detail, followed rapidly the quick preparation of the architect's general plans and the awarding of contracts for the superstructure early in the summer of 1917. This occurred at the time the Government began to issue restraining orders on building work of all kinds.

In September, 1917, the architect, Carl E. Nystrom of Duluth, Minn., secured the services of Carleton F. Tweed and A. W. Kerr, consulting engineers of Minneapolis, Minn., and instructed them to prepare complete plans for the heating, ventilating, and sanitary equipment of the building and later the engineers were employed by the Board of Education to revise the electrical equipment and supervise the complete installation of all mechanical work.

At the time the engineers were employed all foundation work was laid up to the ground-floor level and provision had been made for but two equipment rooms, whereas, in working out the plans, sixteen rooms and three apparatus tunnels were required. To find the necessary spaces for these rooms, it was necessary to plan new floors for same while the building was being erected. This, together with new excavation work, required all the energy and combined efforts of the architect's and engineers' forces, and partially converted the engineers' drafting department into an architectural force.

LOCATION OF SCHOOL.

The new Vocational High School building was erected adjacent to the old Technical High School and is joined thereto with spacious corridors and stairways. The two buildings occupy one entire city block, and on the adjoining block is located the Roosevelt Grade School building with a school playground to the rear.

The new building has ground dimensions of 213 ft. x 220 ft. and is four stories and part basement in height and of fireproof construction throughout. The exterior and main interior walls are of masonry with the balance of partitions of hollow tile, and floors and roof of concrete.

The technical high school building has ground dimensions of approximately 90 ft. x 173 ft. and has three stories and base-

ment; it is of fireproof construction throughout. Together as one unit the two schools are 303 ft. long by 220 ft. wide at the greatest dimensions.

The Roosevelt building has ground dimensions of approximately 90 ft. x 173 ft. and has two stories and basement. It is of masonry and frame construction

SCOPE OF EQUIPMENT.

The combined facilities of the old Technical and the new Vocational School provide courses of study and recreation for seventh and eighth-grade grammar school, complete high school, and two years of junior college work which is accepted for the same as two years' work at the University of Minnesota.

The new school includes thirty-six class rooms, two domestic science rooms used in conjunction with a school cafeteria seating 250 people, together with a general kitchen and bake shop fully equipped with modern equipment of capacity to handle 1000 people per meal of three one-hour periods. Two class rooms on the ground floor are used for agriculture, one of which is especially equipped with modern appliances for dairy study. A beautiful conservatory is erected adjacent to the other.

For manual training and experimental work extensive shops have been provided for wood-working, metal working, automobile study, forge and foundry practice, electrical experimenting, printing, mechanical and architectural drafting, and blueprinting.

In the center of the building is a large auditorium, seating 1450 people, with a stage 22 ft. x 80 ft. The room extends through three story heights, with main floor entrance from ground floor corridor, and entrances to balcony from second and third floor corridors.

The old gymnasium of the Technical building has been remodelled to make room for a new swimming pool with separate showers and dressing rooms for boys and girls. Part of the pool is in the basement of the Technical building, with balance under skylights in light court between the Technical building and the new building. The pool is 28 ft. x 60 ft. Two spectators' galleries are provided, seating 66 persons each. Entrance to pool is from the first-floor corridor.

Two gymnasiums, one for boys and one for girls, with component lockers and shower rooms are located directly over the shops and, together with the shops, occupy the entire west end of the building 60 ft. x 220 ft. The boys' gymnasium is 60 ft. x 120 ft. with running track, and the girls' gymnasium is 60 ft. x 120 ft. with level balcony. Each has a 32 ft. ceiling.

Boys' and girls' toilet rooms are provided on each floor with janitors' closets, separate teachers' toilet room, and locker rooms adjacent to each, and two toilets have been provided for boys at each end of the shops.

In plan the general arrangement of the rooms are nearly symmetrical north and south. This handy arrangement had a tendency to simplify the work of the engineers in finding space for the various equipment rooms, as the location of one equipment room for one side of the building practically solved the location of the similar unit on the opposite side. It was found necessary to provide fifteen equipment rooms to house the various units of mechanical equipment. These were assigned numbers as follows:

Equipment room No. 1 located adjacent to the auditorium above the third-floor corridor at the center of the building.

Equipment room No. 1-A located directly over equipment room No. 1, at center of building.

Equipment room No. 2-A located under sidewalk at west wall of shops near south end.

Equipment room No. 2-B located under sidewalk at west wall of shops near north end.

Equipment room No. 3 located adjacent to and south of shop tool and supply room and directly over south shop toilet room.

Equipment room No. 4 located adjacent to and north of shop tool and supply room and directly over north shop toilet room.

Equipment room No. 5 located directly under south end of stage floor adjacent to and with entrance from equipment room No. 3.

Equipment room No. 5-A located directly under north end of stage floor adjacent to and with entrance from equipment room No. 4.

Equipment room No. 6 located on center line of building directly under pool floor slab.

Equipment room No. 7 located at northeast corner of building directly under teachers' rest room.

Equipment room No. 8 located at southeast corner of building directly under teachers' rest room.

Equipment room No. 9 located directly under northeast main entrance.

Equipment room No. 10 located directly under northwest main entrance.

Equipment room No. 11 located directly under southeast main entrance.

Equipment room No. 12 located directly under southwest main entrance.

Equipment room No. 13 located on center line of building under sidewalk at west wall of shops.

Directly under the ground-floor corridors a recirculating air duct or pipe tunnel had originally been planned under another arrangement at the time the foundations were laid. These tunnels have been converted into apparatus rooms and have been assigned numbers of designation as follows:

Tunnel No. 1 located at center.

Tunnel No. 2 located at north end.

Tunnel No. 3 located at south end.

The Ventilating System

The ventilation of the building was designed so as to be in harmony with the operating requirements of the various departments or sections throughout the building. Independent ventilating units are provided for each section and are so arranged and connected that any one unit may be shut off without in any way affecting the operation of the balance of the system.

The supply ventilating units are numbered 1 to 12, inclusive, and are named according to main room or group of rooms supplied, although several have branch lines extending to smaller component room. Names and numbers for the various units are as follows:

Unit No.	
1	Auditorium.
2A	Shops.
2B	Shops.
3	Boys' Gymnasium.
4	Girls' Gymnasium.
5	Cafeteria and Kitchen.
6	Swimming Pool.
7	North half of corridors.
8	South half of corridors.
9	Northeast classrooms.
10	Northwest classrooms
11	Southeast classrooms.
12	Southwest classrooms.

In general the various systems or units of ventilation provided for each department or section of the building are all somewhat alike in general arrangement. Supply ventilation units No. 2 to 12, inclusive, are similar as to arrangement insofar as the air is drawn in from the fresh-air intake chambers, over three stacks of primary indirect radiation, through an air washer and over two stacks of secondary indirect radiation, provided with by-pass, to the supply fan. Unit No. 1 differs from the others only in that it is divided and two air washers and two sets of primary and secondary indirect radiators are provided, one on each side of a double

inlet double-width fan. Units Nos. 7 and 8 each have three additional reheater sections of indirect radiation placed on the discharge side of the fan and connected to plenum chamber for supplying heated air to corridors and domestic science rooms.

Each unit of supply ventilation has ample capacity to supply all fresh air to the rooms at minimum outdoor temperature of —40° F. (The coldest temperature on record at Virginia is —50° F.)

The proper temperature of the air delivered to the air washer is maintained by operating the diaphragm valves in connection with the primary indirect radiation. Several of the units are provided with additional equipment for the recirculation of a sufficient portion of the air to maintain the desired dew-point temperature of the air, without the use of primary indirect radiation, except as an auxiliary when the outside temperature is below —30° F. With this arrangement additional control equipment is provided for maintaining the temperature of the air delivered to the air washer by operating the fresh air, return air, and outlet dampers simultaneously as hereinafter described in detail. At outdoor temperatures above 40° all fresh air is delivered to all units.

To insure complete distribution of the fresh air in the large rooms and for general exhaust purposes, motor-driven exhaust fans are provided and numbered one to eight, inclusive, and named according to the section exhausting from as follows:

No. 1 Auditorium.
No. 2 Shops.
No. 2A Shops.
No. 3 Boys' Gymnasium.
No. 4 Girls' Gymnasium.
No. 5 Caféteria.
No. 5A Kitchen.
No. 6 Pool and Tunnels.
No. 7 Girls' Toilets.
No. 8 Boys' Toilets.

Exhaust fans, where possible, are installed in same equipment room with supply ventilating unit or in a small independent room close at hand.

Since the individual sections of the building are practically independent from each other, a better understanding of the complete plant will be gained by a brief description of the general arrangement of air distribution in each section.

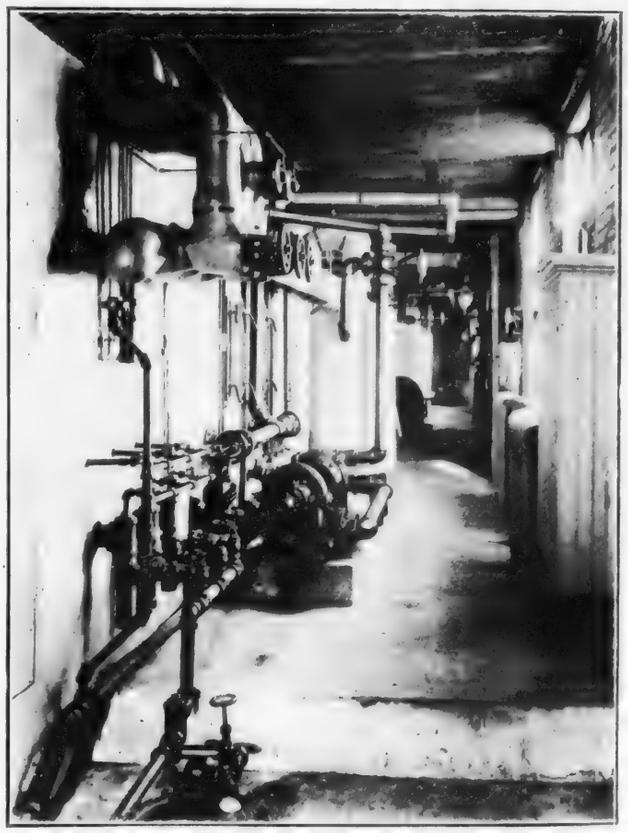
THE MAIN AUDITORIUM.

Although the main auditorium is probably no more efficient than any of the other units, nevertheless, it has a greater opportunity to demonstrate the beneficial features of the modern system of mechanical ventilation. At times the room has catered to overflow crowds and the audience, often made up of twenty-five different nationalities, many coming direct from work at the iron mines, has always remarked at the unusual degree of comfort experienced and the entire freedom of the room from odors.

The room is very beautifully decorated; all air outlets in the ceiling have been made a part of the decorative design and all direct radiation has been concealed in the wall construction. Each radiator so concealed has individual air supply to increase the efficiency of heat transmission from the radiator to the room.

As previously mentioned, the unit is divided into two sections, one on each side of a double-inlet, double-width fan, as shown in Fig. 2. The two air washers are Carrier machines, Type B, with two sets of spray nozzles. This permits using the cold city water which always approximates 50°, for securing additional cooling during hot summer weather.

From the fan the air is discharged into a plenum chamber from which branch air conduits, constructed of galvanized-iron, lead down the corridor flue wall to connect with a series of air distributing chambers, also constructed of galvanized-iron and arranged with adjustable dampers to deliver the proper amount of air to the rooms through small groups of mushroom air diffusers located under the seats of the main auditorium and the lower part of the balcony. A separate branch air conduit extends from the fan plenum chamber branching in two directions and down at each side of stage to connect with additional air inlet grilles located in rear wall of stage. Independent stacks of reheater indirect radiation are installed in each branch to these grilles, and each has an automatically-controlled mixing damper operated from thermostat located on stage to secure uniform temperature. This arrangement was adopted to avoid the use of objectional radiation on the real wall of the stage.



MAIN AUDITORIUM UNIT, VIRGINIA VOCATIONAL HIGH SCHOOL.

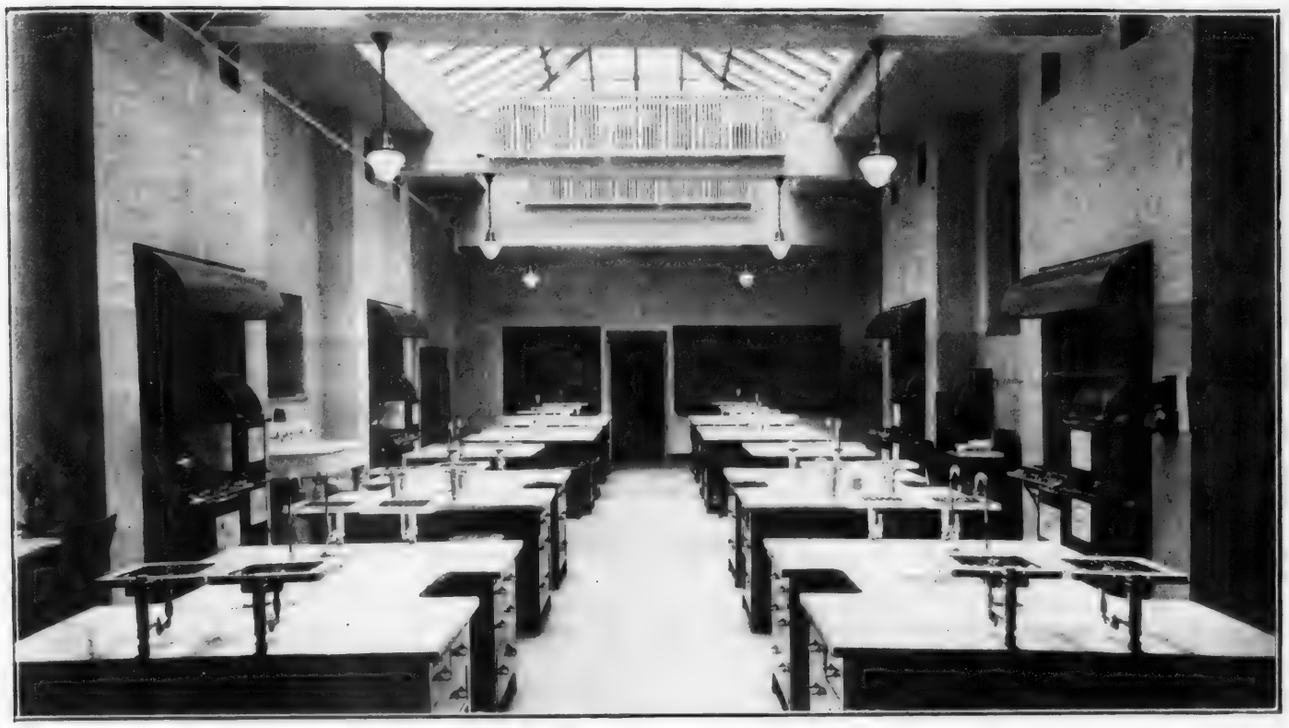
The fan is provided with variable speed motor, and branch ducts leading from plenum chamber are provided with automatic louver dampers with pneumatic switch control. This arrangement permits the use of a reduced air supply and the delivery of same entirely to the main floor when the room is only partially occupied.

As foul air would be trapped in the hollow formed by the pitch of the balcony a special system of exhaust ventilation is provided to remove this air. Special ornamental ceiling grilles are provided which connect through a system of galvanized-iron ducts and risers leading to the auditorium exhaust fan located in Equipment Room No. 1A, and arranged to discharge to atmosphere through special-design exhaust louvers. This exhaust system has a capacity for exhausting 15,500 cu. ft. of air per minute.

Natural exhaust is provided for the main auditorium through special-design grilles located in furred ceiling of main room and connected to a system of galvanized-iron outlet ducts located in furred space over auditorium with vents through roof ventilators, and return air connections to each air intake chamber.

THE SHOPS.

The final arrangement of the equipment for the shops was arrived at only after many difficulties and costly experiences due to structural problems. The original arrangement con-



DOMESTIC SCIENCE ROOM, VIRGINIA VOCATIONAL HIGH SCHOOL.

templated the installation of a single supply unit and a single exhaust unit each having a capacity for 37,000 cu. ft. of air per minute. The equipment room for both of these units was to be installed directly under the roof of the west end of the building over the shower and locker rooms for the two gymnasiums. This room was also planned to house two small exhaust fans, one for each gymnasium. After the plans were completed and contracts awarded it was found that the structural work, especially the footings, would not carry the weight of this heavy equipment and it was found necessary to find other space for same. As the building walls were at the third-floor level by this time, the problem of finding space was no easy matter and it was only after two months of study and the making of many preliminary sketches that the final arrangement was decided on and approval given. Needless to say, there was quite an "extra" for both the general contractor, and the heating and ventilating contractor.

As the shops are evenly divided into an equal number of bays, each 20 ft. wide, 60 ft. long, and 24 ft. high, the original system of ventilation called for the distribution of the same amount of air to each bay. This air was to be discharged a few feet below the ceiling from an outlet duct at one side of each bay with one-fourth air exhaust at floor outlets on opposite side of bay, one-half air exhaust from same side of bay and one-fourth air exhaust from a system of ceiling skimmers. The resourcefulness and the amount of study and care exercised by the engineers is shown in that the same arrangement of air supply is maintained in the final arrangement although it was found necessary to bring the supply air up from the floor, instead of down from the ceiling as originally planned.

The final arrangement of apparatus provided for two units of supply ventilation, each having a capacity of 19,500 cu. ft. of air per minute. The units are installed in two equipment rooms located at the side of the shops under the sidewalks. Air is drawn in through intake openings located a few feet above grade level and is delivered to the rooms through a system of concrete supply ducts located under the shop floor and connecting with riser ducts furred in along-side of the columns and leading to outlet grilles located a few feet below shop ceiling.

Exhaust ventilation is provided for in a series of openings or skimmers evenly spaced over the shop ceiling and a series of grilles located in exhaust chambers, built of concrete to special design around the base of the columns. The collection system consists of a series of underground concrete ducts leading to a concrete air chamber at each end of shops in which is installed a double-inlet, double-width exhaust fan having a capacity of 19,500 cu. ft. of air per minute.

The two equipment rooms for the shop supply units and the main supply and exhaust tunnels are below the footings of the building, which required additional care on the part of the architect and contractor in permitting their installation after the building was up to the third-floor level.

No provision is made for recirculation in the shops other than the opening of the doors leading through the air intake chambers from the main floor.

THE GYMNASIUMS.

The design of the ventilation for the boys' and girls' gymnasiums is considered ideal. Air is drawn in at the roof and, together with the return air when such is used, drawn down an intake shaft to the air-intake chamber. It is then discharged through a system of horizontal ducts, located along wall of equipment room and in furred space at shop entrance ceiling, to a series of vertical flues connecting with a system of horizontal ducts, suspended under the track floor, and leading to supply grilles located in side of furring.

A system of exhaust ventilation exhausting one-fourth of total air delivered to gymnasium, is provided for through a series of eight outlet grilles, located four in east flue wall and four in west flue wall near floor. Grilles are connected with drop connections leading to two horizontal exhaust ducts under floor in furred spaces at shop ceiling and adjacent to shop supply and exhaust ducts. Horizontal ducts lead to two double-inlet, double-width exhaust fans located under the discharge of the supply fan in same equipment room. These exhaust fans also were re-located and duct work re-designed at same time as shop equipment. A branch line connecting with each exhaust system exhausts air through all storage lockers for gymnasium clothes and thus assists in drying same and pre-

vents the objectionable odors experienced in locker rooms not having this desirable feature.

Natural exhaust is provided for all air not mechanically exhausted as above described. Vent grilles at track floor are connected with two triangular ducts at ceiling of gymnasiums, cross-connected at two locations with two outlets at center through roof ventilators and return-air connection to fresh-air intakes. Openings are provided at side of each triangular duct at various locations for ceiling exhaust.

The instructor of physical education at the school mentioned to the writer that one of the pleasant features of teaching in the boys' gymnasium was that the room and equipment did not smell like a gymnasium.

Two flags are located at each inlet opening around the track and balcony of the rooms and presents a rather pretty effect as they flutter in the gentle breeze coming through the grilles.

THE CAFÉTERIA AND KITCHEN.

Supply ventilating unit No. 5 is located in Tunnel No. 1. Air is drawn in at the second-floor level from the light court and down air-intake shaft to air-intake chamber. It is discharged from supply fan to plenum chamber, from which two main risers of equal size rise to furred space over caféteria, connecting with a system of galvanized-iron ducts with drop connections to grilles in side of caféteria and at side of columns in kitchen.

One-half of the air delivered is exhausted through grilles located at ceiling in dividing partition between caféteria and kitchen. These grilles are connected to a system of galvanized-iron ducts located at ceiling of kitchen and in space under stage floor and lead to suction chamber of exhaust fan No. 5 located in equipment room No. 5. Foul air from the fan is discharged through a vertical riser at southeast corner of stage, with outlet above roof.

The balance of air delivered is exhausted through canopy hoods over kitchen equipment and through grilles in rear wall of kitchen. Inlet grilles are provided at floor in dividing partition between caféteria and kitchen. Hoods and outlet grilles are connected to a system of ducts, constructed of American Ingot iron, and leading to suction chamber of exhaust fan No. 5A, with by-pass connection to discharge duct. By-pass dampers are provided with fusible links to shut off fan suction and discharge, should accumulated grease in ducts become ignited, and an alarm bell connected to ring in such event. Foul air from the fan is discharged through a vertical riser at northeast corner of stage with outlet above roof.

THE SWIMMING POOL.

Supply ventilating unit No. 6 is located in Tunnel No. 3. Air is drawn in at second-floor level from light court and down air-intake shaft to air-intake chamber, and is discharged from supply fan through a system of galvanized-iron ducts under pool floor to short vertical risers connecting with supply grilles at floor of pool.

A single stack of reheater radiation, located at ceiling of equipment room No. 6 and provided with two automatic mixing dampers, is installed in connection with two branch lines extending horizontally over main supply ducts on each side of pool to short vertical risers connecting with supply grilles under seats of dressing stalls in shower rooms above. The mixing dampers are controlled by duct thermostats located in the discharge duct of heater set to maintain a uniform temperature of delivered air at 85°.

Exhaust ventilation is from grilles at ceiling of pool connecting with a system of galvanized-iron ducts and risers leading to exhaust fan No. 6, located in equipment room No. 1A. A branch connection from pool to exhaust risers in corners of each corridor leading to technical building is made to opening under pool floor for tunnel exhaust.

THE CORRIDORS.

Supply ventilating units Nos. 7 and 8 are located in tunnel No. 3. Both units and systems are symmetrical. Air is drawn in at second-floor level and down an air-intake shaft to the air-intake chamber, and is discharged from the fan over three stacks of reheater radiation provided with by-pass, to a plenum chamber located under each alcove locker room, off corridors. Each plenum chamber is divided horizontally with double-insulated galvanized-iron partition level with and attached to channel-iron supporting heater and extending to concrete walls. The upper part of plenum chamber is for warm air and the lower part for tempered air. At each side of plenum chamber automatic mixing dampers are provided and connected to independent galvanized-iron ducts leading to supply grilles in corridors, and domestic science rooms. Mixing dampers are controlled by thermostats located in corridors and rooms.

Part of the air delivered to the corridors is exhausted through toilet and locker rooms. Natural exhaust is provided in two flues connecting to vent openings at west end of first, second, and third-floor corridors, and leading to open space around class-room vent ducts in furred space over third-floor corridors from which an outlet is provided through roof ventilator. Air delivered to Domestic Science rooms is exhausted through grilles at ceiling and through hoods over ranges. Grilles and connections from hoods are connected to a system of galvanized-iron ducts and risers leading to toilet exhaust fans located in equipment room No. 1A.

ONE OF THE EXHAUST FAN ROOMS, VIRGINIA VOCATIONAL HIGH SCHOOL.

THE DOMESTIC SCIENCE ROOMS.

Originally only one domestic science room was provided for, but crowded conditions made it necessary to secure more accommodations and accordingly the dairy room and agricultural display room were moved to another location in the building and an exact duplicate of the first domestic science room was completed on the opposite side of the caféteria. The two rooms now have a capacity for teaching 500 pupils per day.

The arrangement of tables and equipment shown in the illustration is one of the very best that the writer has ever had occasion to install. Under each table mushroom air diffusers are installed receiving air from a system of galvanized-iron ducts in connection with the corridor fans. Air is exhausted through grilles at ceiling and through hoods over ranges to a branch exhaust duct connected to the toilet exhaust fans. This upward movement of air keeps the air at the breathing line pure and wholesome and also prevents all odors from escaping into the corridors, as the exhaust system removes a greater amount of air than that furnished by the supply system.

(To be continued.)

Improving Air Conditions in a Chicago Bank Building

How Tests Disclosed the Faults in the Ventilating System and Suggested the Remedy

BY E. VERNON HILL.

THE Harris Trust and Savings Bank building, in Chicago, is a nineteen-story brick structure with entrance on Monroe Street. The bank proper occupies the main floor and it has a balcony on the south and east sides. Directors' rooms, private offices, etc., occupy space on the main and balcony floors.

Complaints on the part of the bank's employees of objectionable drafts and of large amounts of soot and dust when the ventilating equipment was in operation, and of inadequate air supply, foul air, etc., when the equipment was not in operation, led to a series of tests of the air conditions in the banking room itself, as well as in the stenographic room on the third floor and in another room known as the "Commercial and Circulation Department."

Opening the windows under the circumstances cited gave rise to objectionable drafts in the immediate region of the windows. Large amounts of dust were also blown into the building through the windows, to say nothing of the effect of outside noises.

Tests were made, therefore, to determine the percentage of perfect ventilation maintained when the equipment was in operation and the cause of the objectionable conditions already referred to. It was believed also that the tests might assist the architect and engineer in the re-design of the ventilating equipment when the bank space was remodeled.

The building furnishes its own light, heat and power. The boiler-room in the basement is equipped with three 250-H. P. return tubular boilers with Murphy stokers. The engine room is in the basement proper.

Two Massachusetts fans supply the air for the ventilating equipment. The smaller of the two fans serves the engine room and some space on the main floor near the entrance. Air supply for the banking space proper is furnished by the larger fan which is of the squirrel-cage type, with a 9-ft. housing, delivering, at the time of the test, 21,000 C. F. M.

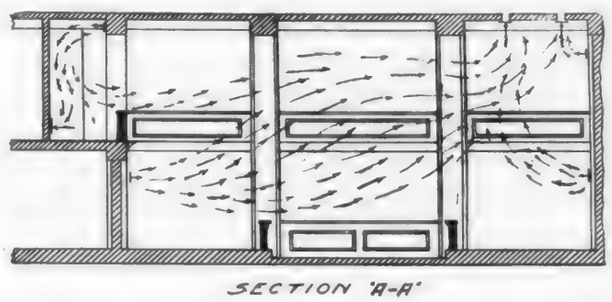
Each of the supply fans is equipped with an air washer, the smaller fan with an air washer in a concrete housing, designed and constructed by the engineer of the building. The other washer is an old-type horizontal baffle machine, with a rainfall spray.

The total amount of indirect radiation is 4900 sq. ft., approximately 1800 sq. ft. for the smaller fan equipment and 2100 sq. ft. for the larger fan. About one-third of the heating coils are in the tempering air chamber and two-thirds used for reheating.

A rather unfortunate feature of the equipment is the location of the air intake. This is on the east side of the building, about the height of the third floor. The intake is in a pocket or wall formed by the high walls surrounding it, particularly on the west and north sides and, for this reason, the air supply necessarily contains a large amount of dust and soot.

On the second floor near the west wall are located two centrifugal exhaust fans for removing the air from the banking space proper and from some adjoining rooms through a ceiling grille. These fans have an 8-ft. housing, the north fan exhausting 25,500 C. F. M. and the south fan, 20,500 C. F. M.

Temperature regulation is obtained by thermostats (National system) conveniently located controlling the reheaters. A sufficient amount of direct radiation is provided in the bank proper and the various rooms to care for the heat losses from the building. Air from the ventilating equipment is introduced at 82° F.

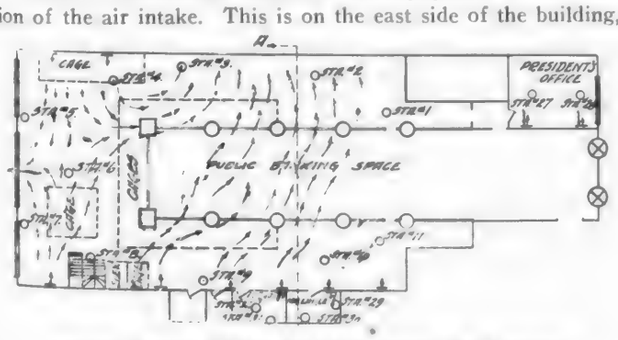


SECTION A-A, HARRIS TRUST BUILDING.

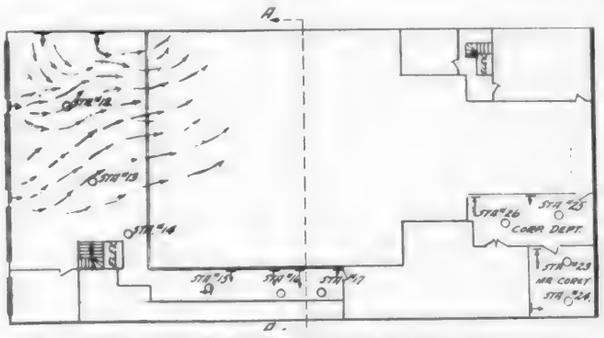
The test was conducted in accordance with the standard method developed by the Ventilation Division of the Chicago Health Department and recently adopted as standard by the American Society of Heating and Ventilating Engineers. It consists, briefly, in locating stations at representative points throughout the room to be tested, making determinations of wet and dry-bulb temperatures, air motion, dust, bacteria and odors at these stations and plotting the results on the Synthetic Air Chart. The location of the stations is shown in the accompanying illustrations.

RESULTS OF TEST.

1. Banking space, main floor. The final percentage in this test was 88.9, rather lower than should prevail in a mechanically-ventilated space of this character. It will be seen from



FIRST FLOOR PLAN, HARRIS TRUST BUILDING.



BALCONY FLOOR PLAN, HARRIS TRUST BUILDING.

the chart (Fig. 5) that the principal factor causing penalization was the poor distribution, the distribution percentage being less than 80. The next most important factor was the dust count which averaged 16,140, the highest count being 19,870.

Wet-bulb temperatures averaged 56.2° which was almost ideal at the time of the test, being only 0.2 of a degree above what it should be. The dry-bulb temperature ranged from a minimum of 71° to a maximum of 72.5°, a comparatively narrow margin of variation. The important factors that should be corrected in this space are poor distribution and high dust count.

2. Balcony space. The final percentage in this test is 94 which is quite satisfactory but could be further improved by reducing the dust content. The wet-bulb in this space was slightly higher than that mentioned in the banking space, being ¾° above the desirable point, but on the whole conditions observed at the time of the test should cause no complaint.

3. Stenographers' room, second floor. The final percentage in this room was 87. It should be well above 90. The principal difficulty in this test was the poor air distribution and a low wet-bulb temperature. This room is not provided with mechanical air suply. Exhaust registers connected with main exhaust fans are located in the walls of the fan chamber in the northwest corner of the room. The air supply, as shown by the CO_2 analysis, was not deficient at the time of the test but it is probable that it would be in cold weather.

4. Commercial and Circulation Department. This test gave a final percentage of 90, which would be materially improved by decreasing the wet-bulb temperature or reducing the temperature of the dry-bulb. The CO_2 analysis in this room gave 9.35 parts, which is to be expected in view of the absence of either mechanical supply or exhaust.

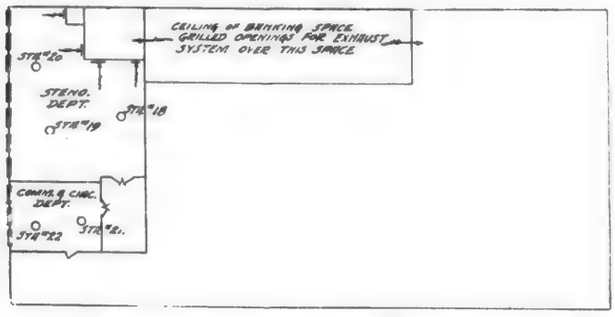
5. Corporation Department. The final percentage in this test is 93, the only penalization factors being the poor distribution and the high dust count, which are particularly outstanding. The bacteria plates exposed were negative, which is very remarkable considering the high percentage of dust in the air. It is probable that the failure of the culture to develop colonies in this room was due to some defect in the culture itself or the technique, as it is unexplainable otherwise. It is, therefore probable that the percentage shown by the test is higher than should be given.

6. President's room (no occupants). This test gave a final percentage of 91. The CO_2 as was expected, is practically the same as the outside air owing to the absence of occupants in the room. The wet-bulb temperature was high following the dry-bulb. This condition apparently results from the double windows and the low heat loss from this room.

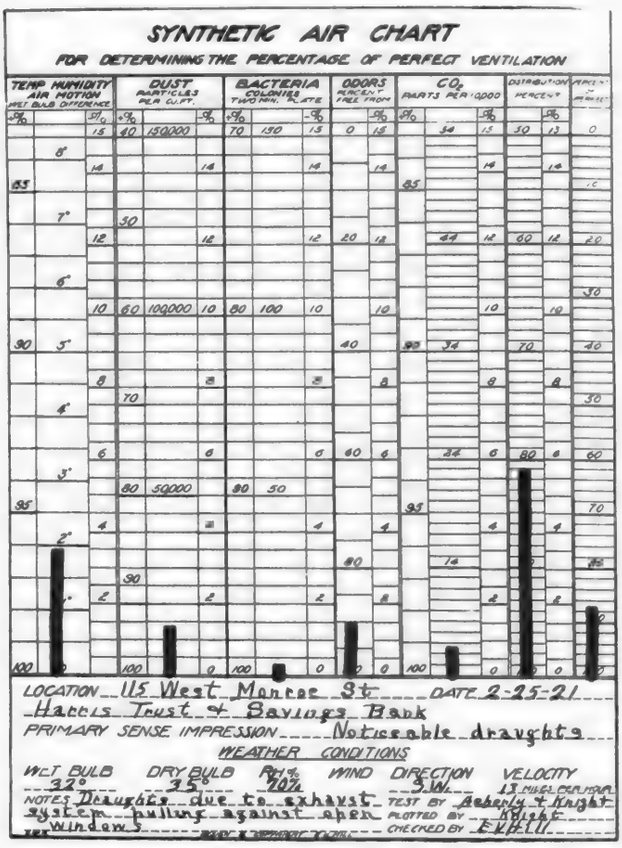
7. Mr. Corey's room (no occupants). This room gave a percentage of 93. The only important feature in this test was the high dust count, averaging 29,000 particles.

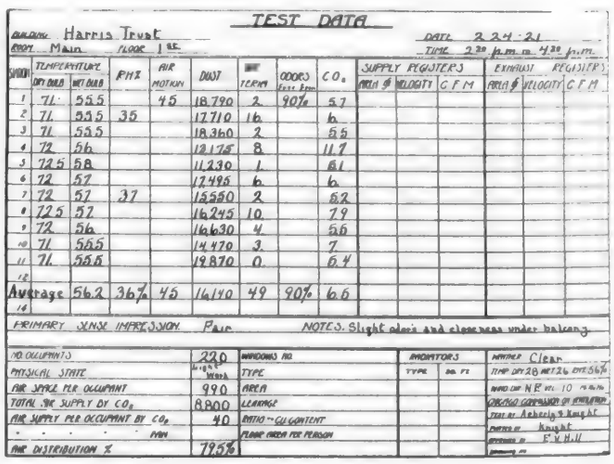
8. Mr. Lingle's room. The percentage in this test is 93 plus. The outstanding features are poor distribution and a high dust count.

9. Mr. Jones' room. This test gave a final percentage of slightly above 85. Poor distribution is apparent from the test and also a high wet-bulb temperature. The wet-bulb was 59°, being 3.5° above desirable. The dry-bulb was 73°. The dust count in this room was 14,600 which although entirely too high appears to be an improvement over the count in other rooms tested.



SECOND FLOOR PLAN, HARRIS TRUST BUILDING.

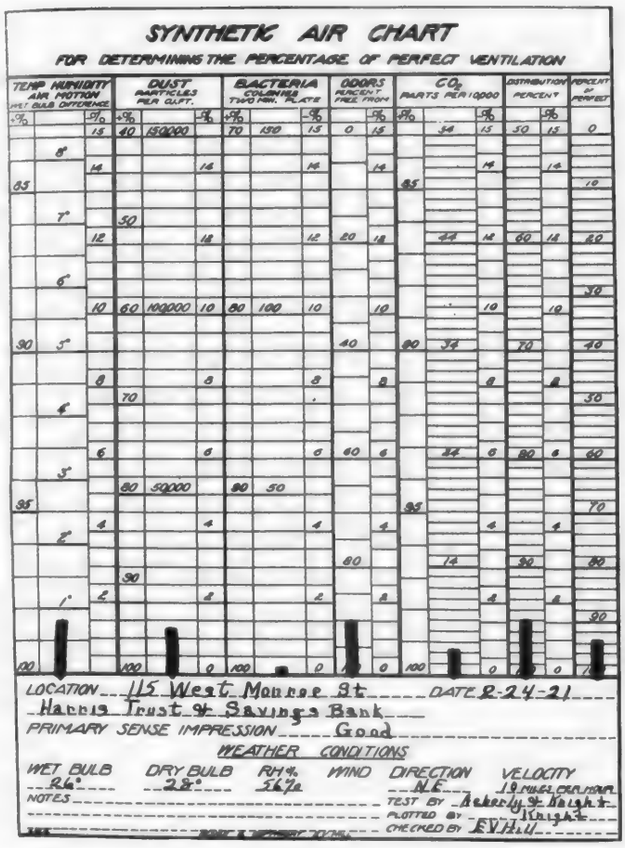

SYNTHETIC AIR CHART
FOR DETERMINING THE PERCENTAGE OF PERFECT VENTILATION
TEMP HUMIDITY AIR MOTION WET BULB DIFFERENCE
DUST PARTICLES PER CU. FT.
BACTERIA COLONIES TWO MIN. PLATE
ODORS PERCENT FREE FROM
CO2 PARTS PER 10000
DISTRIBUTION PERCENT
PENALTY PERCENT
LOCATION 115 West Monroe St. DATE 2-25-21
Harris Trust & Savings Bank
PRIMARY SENSE IMPRESSION Noticeable draughts
WEATHER CONDITIONS
WET BULB 32°
DRY BULB 35
R.H.% 70%
WIND DIRECTION S.W.
VELOCITY 13 MILES PER HOUR
NOTES Draughts due to exhaust system pulling against open windows
TEST BY Ackerly & Knight
PLOTTED BY Knight
CHECKED BY E.V.H.II

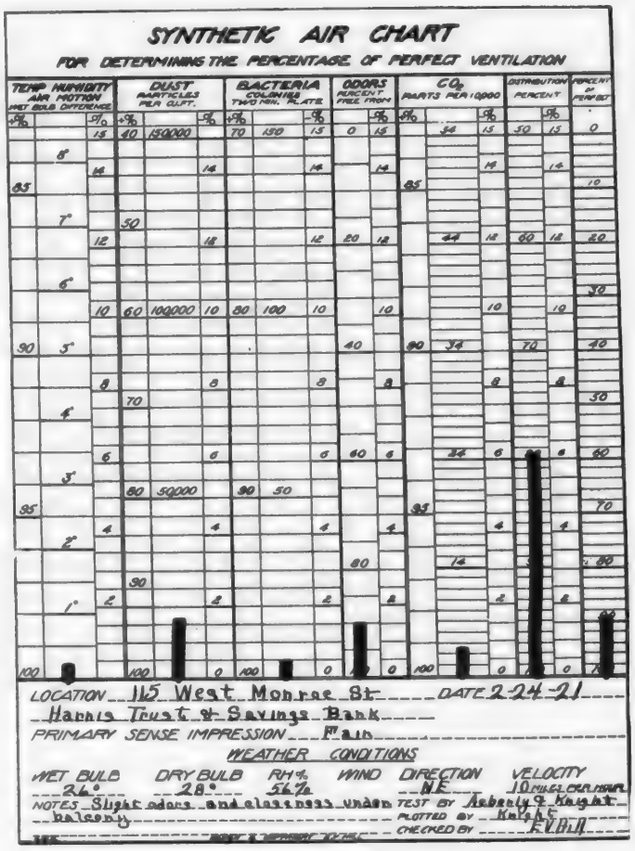

TEST DATA
BUILDING Harris Trust
ROOM Main FLOOR 1st
DATE 2-24-21
TIME 2:30 p.m. to 4:30 p.m.
SPACE
TEMPERATURE DRY BULB WET BULB
R.H.%
AIR MOTION
DUST
BACTERIA TWO MIN. PLATE
ODORS Free from
CO2
SUPPLY REGISTERS AREA # VELOCITY C.F.M.
EXHAUST REGISTERS AREA # VELOCITY C.F.M.
1 71 55.5 45 18,790 2 90% 5.7
2 71 55.5 35 17,710 16 6
3 71 55.5 18,360 2 5.5
4 72 56 12,175 8 11.7
5 72.5 58 11,230 1 6.1
6 72 57 17,495 6 6
7 72 57 37 15,550 2 6.2
8 72.5 57 16,245 10 7.9
9 72 56 16,630 4 5.6
10 71 55.5 14,470 3 7
11 71 55.6 19,870 0 6.4
12
13 Average 56.2 36% 45 16,140 49 90% 6.6
14
PRIMARY SENSE IMPRESSION Poor
NOTES: Slight odors and close ness under balcony
NO. OCCUPANTS 220
PHYSICAL STATE
AIR SPACE PER OCCUPANT 990
TOTAL AIR SUPPLY BY CO2 8800
AIR SUPPLY PER OCCUPANT BY CO2 40
AIR DISTRIBUTION % 79.5%
WINDOWS NO
TYPE
AREA
LEAKAGE
RATIO—CU. CONTENT
FLOOR AREA PER PERSON
MONITORS
TYPE
WEATHER Clear
TEMP OUT 28 WET 26 DRY 56.7
WIND DIR N.E. VEL. 10
CHECKED COMPARISON OF EXHAUSTS
TEST BY Ackerly & Knight
PLOTTED BY Knight
CHECKED BY E.V.H.II

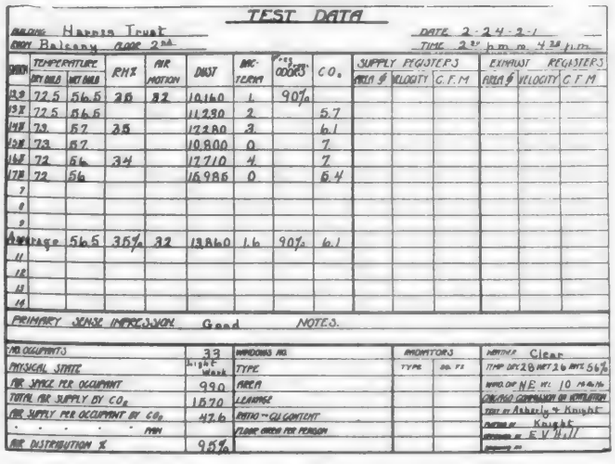
TEST RESULTS IN MAIN ROOM, FIRST FLOOR, HARRIS TRUST BUILDING.

GENERAL DISCUSSION OF TEST DATA

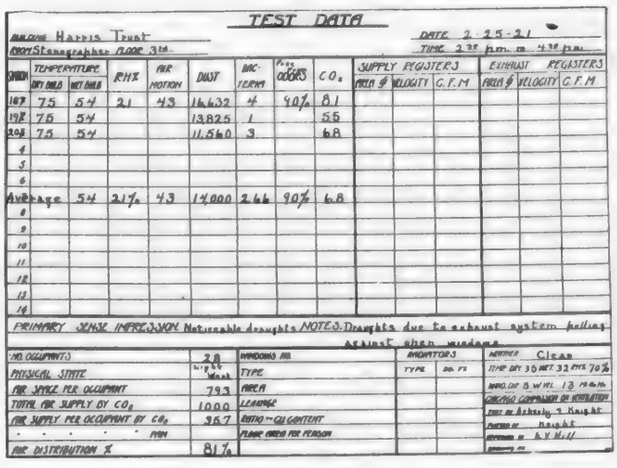
The outstanding features in all the tests are the poor distribution and the high dust count. The poor distribution was particularly noticeable on the main floor of the bank. Referring to the first-floor plan, it will be seen from the indicating arrows that the general direction of air motion is from the east side of the room across the public space to the west side. The air velocity varies considerably in this space, the average being 45 ft. per minute. In the region of the center column, between stations 9 and 10, on the east side, the velocity is quite high, reaching 60 ft. per minute. The occupants of the cage near this column and those seated at the desks in the


SYNTHETIC AIR CHART
FOR DETERMINING THE PERCENTAGE OF PERFECT VENTILATION
LOCATION 115 West Monroe St DATE 2-24-21
Harris Trust & Savings Bank
PRIMARY SENSE IMPRESSION Good
WEATHER CONDITIONS
WET BULB 26° DRY BULB 28° RH% 56% WIND DIRECTION NE VELOCITY 10 MILES PER HOUR
NOTES
TEST BY Acberly & Knight
PLOTTED BY Knight
CHECKED BY E.V.H.U


SYNTHETIC AIR CHART
FOR DETERMINING THE PERCENTAGE OF PERFECT VENTILATION
LOCATION 115 West Monroe St DATE 2-24-21
Harris Trust & Savings Bank
PRIMARY SENSE IMPRESSION Fair
WEATHER CONDITIONS
WET BULB 24° DRY BULB 28° RH% 56% WIND DIRECTION NE VELOCITY 10 MILES PER HOUR
NOTES Slight odors and glass does not unless balcony is open
TEST BY Acberly & Knight
PLOTTED BY Knight
CHECKED BY E.V.H.U



Balcony, Second Floor.



Stenographers' Room, Third Floor.

TEST RESULTS IN HARRIS TRUST BUILDING.

vicinity complain of drafts, which is quite natural.

The air passing across the public banking space here takes an upward direction, as shown in sections "AA," to the exhaust openings in the ceiling, no objectionable drafts being noted in the clerical space along the west wall. At station 4 there is practically no air motion and apparently a reduced air supply, as the CO_2 content at this station was 11.7. The wide variation in the CO_2 analysis of the various stations and also in the colony count of bacteria further emphasizes the faulty distribution of air.

Dust. Where mechanical ventilation is in use in connection with efficient air-cleaning devices we do not expect to obtain a dust count of more than 6000 or 8000 particles per cubic foot, and 10,000 should be the maximum. We often obtain as low as 4000 or 5000 where well-directed efforts have been made to keep the dust content low. It is impossible to introduce sufficient air for ventilation purposes in the "Loop" district of Chicago without serious objections from dust unless an efficient air washer is employed.

MISAPPREHENSIONS REGARDING AIR WASHERS

A general misapprehension seems to have prevailed in the past as to the manner in which an air washer operates. The general belief apparently was that passing air through a rainfall, spray or sheet of water removed the dust. The eliminator plates back of the sprays were designed originally to remove entrained moisture.

Tests of washers similar to that shown in Diagram "B" which has two banks of sprays and vertical eliminators, show that approximately 88% of the total amount of dust removal from the air passing through is accomplished by the eliminators themselves and only 2% or 3% by the sprays.

The present theory of dust removal in an air washer is

that when a current of air strikes a wetted surface, the dust, on account of its momentum, strikes and adheres to the surface, while the air current passes around it. It is probable that the nearer the angle of impingement approaches a right angle, the greater will be the efficiency of the device in dust removal. The use of the sprays in a washer is simply to keep the eliminator plates wet and clean. Experiments have shown that a current of air must be thrown successively against the wetted surface from six to nine times to remove the dust, depending upon its character, air velocity, etc.

In the ventilating system under discussion the washers contain only two V-shaped horizontal baffles. Consequently, the air passing through impinges against a wetted surface only three times. (See Diagram "A"). Also, the spacing between the baffles, 6 in., is so wide that a relatively large amount of air passes between the baffles without impinging. Diagram "B" illustrates this point and Diagram "C" is a suggestion for a design containing no spray chamber, but a continuous baffling surface in which the air would be thrown nine times against the plate. A considerable amount of experimental work has been done on the design referred to and its efficiency demonstrated.

TEMPERATURE CONDITIONS AND DRAFTS.

One of the important features in the satisfactory operation of mechanical ventilating devices is the temperature control. Not only is it necessary to control the dry-bulb temperature, but also the relative humidity should not be allowed to vary if the dry-bulb is held constant, for a temperature of 70° is altogether too low with a humidity of 35% or below, especially if the air motion is relatively high. Likewise a temperature of 70° is too high for comfort if the humidity is much above 40%. In very cold weather, therefore, the relative humidity control is essential for comfort and to eliminate drafts.

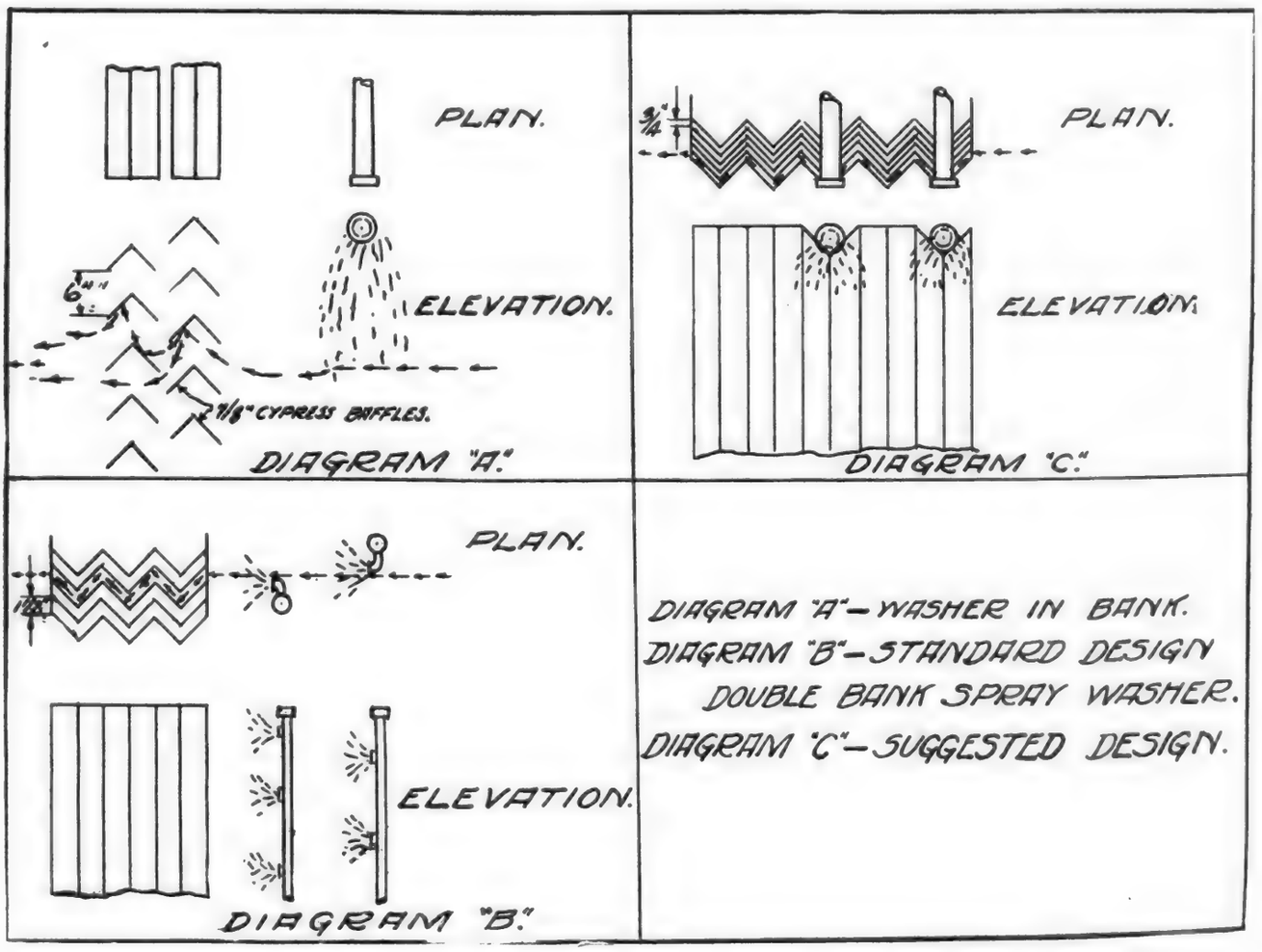
CONCLUSIONS.

In reviewing the test and the air charts plotted from the same one might arrive at the conclusion that inasmuch as the final percentage in most rooms is close to 90 the mechanical equipment is satisfactory. This, however, is not the case inasmuch as the tests were made under particularly favorable conditions. On the first day of the test the outside temperature was 28° F., with a humidity of 78%. On the second day of the test the outside temperature was 35° F. and the relative humidity 73%. In both these instances air warmed to room temperature gave a much better wet-bulb than would be obtained if the outside temperature were low. Furthermore, objectionable drafts in the building are not as noticeable in mild weather as when the weather is cold. Charts of air tests represent conditions as they existed at the time the test was made and are necessarily modified by outside conditions. If these tests had been conducted in zero weather the final percentage would be much lower. One can readily see from examination of the charts made under these favorable conditions that the operation of the equipment would occasion numerous complaints in cold weather.

RECOMMENDATIONS.

In re-designing the system attention should be given to the following details:

1. Marked improvement in the location of supply and ex-



SUGGESTED DESIGN FOR AIR WASHER BASED UPON RESULTS SECURED WITH TWO WIDELY-USED TYPES.

haust registers is essential so as to secure an even distribution of the air throughout the occupied space.

2. Efficient air washers guaranteed to remove at least 95% of the dust in the air should be installed. We have no test data as to the efficiency of the washers in the building at the present time but our judgment is that they have an efficiency of somewhere between 20% and 40%.

3. The equipment contains many long runs of horizontal ducts that are loaded with dust and dirt from years of service and from the inefficient operation of the washers. In redesigning it is essential that the ducts be thoroughly cleaned and that access doors be provided for future cleaning, as any washer would be unsatisfactory if the ducts were loaded with dirt. Variation in air pressure under those conditions would tend to loosen the dirt and distribute it into the air supply.

4. Humidity control is highly desirable and would add much to the satisfactory operation of the equipment.

5. The location of the intake is unfortunate. If it could be re-located or raised a sufficient height to obtain a cleaner air supply, improvement would be noted. However, if efficient washers were in use the expense of rebuilding the intake might not be justified.

The entire amount of air handled by the equipment is adequate for all ventilation purposes. The excessive amount exhausted over that supplied is accountable for some of the objectionable drafts complained of and probably a reduction in the amount of air exhausted and a corresponding increase in the supply is desirable.

Next month, Dr. Hill will describe the changes that were made in the ventilating equipment of this building and what a new series of tests showed, after the remodeled system was put into operation.

Allowing Discontinuance of Worn-Out Heating Mains in Outlying Districts

In granting to the Southern Illinois Light & Power Company authority to discontinue service to certain hot water consumers on an outlying extension of the system, which had been unwisely made, the Illinois Public Utilities Commission said that when the useful life of these outlying mains had expired, and the fixed charges on the cost of rehabilitation could not be borne by the consumers' connected thereto, except through prohibitive rates, it would not be fair or equitable, under existing circumstances, to require other consumers to assume these fixed charges. The Commission also considered that if these mains were not rebuilt, the consumers connected thereto should be given ample time to install private plants before central station heat was discontinued.

Fuel Economy Survey of Veterans Bureau Hospitals

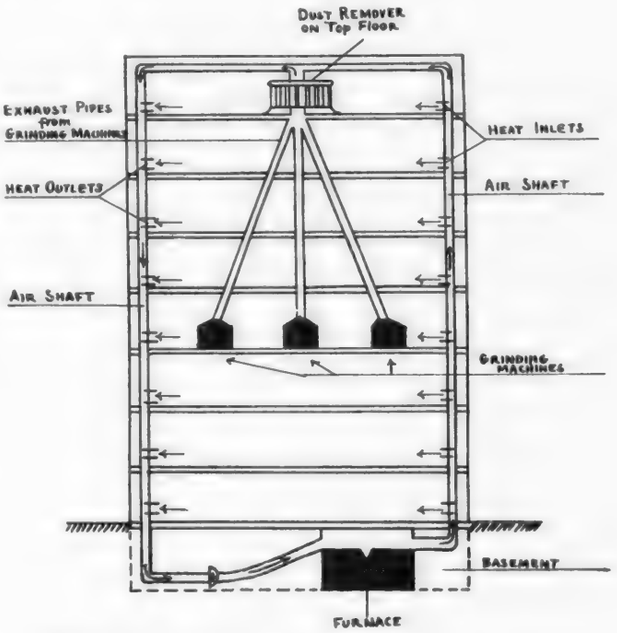
At the request of the United States Veterans' Bureau, the Bureau of Mines has undertaken an investigation of the fuel requirements of the different hospitals of the Veterans' Bureau. A fuel engineer from the Pittsburgh office has been detailed to make the survey, which covers two main lines (1) the present fuel-using practice of these institutions; and (2) the sources and kinds of fuel now used by the hospitals in order to suggest economy through the use of kinds of coal that can be obtained at lower cost, with equal efficiency, and from mines nearby for the sake of lower freight costs.

The engineer in charge of this survey has covered the hospitals in the Southern Atlantic States, and is now visiting those in the New England and Central Atlantic States. On his return, he will submit to the Veterans' Bureau a report covering these two groups of hospitals.

Heating a Building by Friction

A heating system which will use heat generated by friction in the flour-grinding process is to be installed in the new mill of the Kansas Flour Mills Company, now under construction in North Kansas City, Mo.

It is estimated that the new system will result in a saving of at least 300 tons of coal a year. It is said to be the first time the plan of using waste heat to heat a building has ever been tried.



SCHEME FOR HEATING A BUILDING BY FRICTION.

The accompanying diagram illustrates the principle by which the engineers believe the plan will succeed. Heat generated by the grinding process in the milling machines and from the friction in the transmission machinery is discharged from the exhaust pipes into a dust remover on the top floor of the 8-story building. A large fan in the basement then draws the heated air through an air shaft to the basement and forces it up another air shaft to the top floor, thus making a complete air shaft circuit from the basement to the top floor.

The hot air circuit established, the rest of the heating plan operates in a manner practically the same as the warm-air furnace heating system. The warm air moving up in the circuit is discharged from the air shaft into any of the floors through warm-air openings. Other openings on each floor allow the air to recirculate through an air shaft on the opposite side of the building.

When the milling machinery is not in operation the building will be heated by warm-air furnaces, which are to be installed in the basement as a part of the new heating system. The plan will operate in the same manner when the furnaces are in use, the air being pumped over the heated furnace and into the same air-shaft circuit.

The new system will be installed by the E. K. Campbell Heating Company, 2445 Charlotte Street. E. V. Hoffman, vice-president of the Kansas Flour Mills Company, said the new plan was developed during experiments in using the exhaust heat to regulate the humidity of the air in the mill.

The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Member of the Associated Business Papers Inc.
Member Audit Bureau of Circulations.

Vol. 19 November, 1922 No. 11

Published Monthly at Cooperstown, New York, by the
HEATING AND VENTILATING MAGAZINE COMPANY
Executive and Editorial Offices
1123 BROADWAY, NEW YORK
A. S. ARMAGNAC . . . . . President and Editor
GUSTAVE PETERSEN, Secretary-Treasurer and Business Manager

European Representative
W. G. HOLLINWORTH, 38 Victoria St., London, S. W.

Subscription	$2.00 per year
Canada	2.25 per year
Foreign Countries	2.50 per year
Back numbers	25 cents each

THOSE in the heating and ventilating industry who are not "sold" on the research idea should hear some of the things that are being said on the subject in other industries which have no research work under way. They should hear, too, of the way American manufacturers are coming to look upon research work as a vital adjunct of their business. Indeed, it has already come to the point where an industry without its research activities is being considered a laggard, while the one that has had the vision and courage to go in for a study of the fundamentals in its field is being accorded a corresponding prestige. It may be hard to tell just how far the Research Laboratory of the American Society of Heating and Ventilating Engineers has been responsible for the astonishing growth in recent years of the heating and ventilating industry, but the quicker the engineering public recognizes this connection, the better it will be for everyone concerned. If this is putting the matter on a dollars and cents basis, it is because sufficient and, perhaps, too much emphasis has been laid on the elevation of the industry that will result from the laboratory's researches. Most of us are kept pretty busy making a living and it is high time the profession realized that "this research idea" has got some "bread and butter" arguments behind it.

To speak first of the yearning in other industries which are now without research bureaus, here is how Floyd W. Parsons sizes up the situation in the gas industry. Writing in *Gas Age-Record* he says:

"The field of research in the gas industry, as in other industries, is practically a virgin land of romance and adventure." He then refers to the research work started only a year ago by the leather interests and says:

"I might go on and show what the laundrymen have done, or take up the research work of the tanners, or outline the program for research that is now being developed in the oil industry, but I am sure it is not necessary to carry the discussion to such a length to gain the ear and the support of gas men for the inauguration of a more definite and a far more complete program of research in the gas industry. Unfortunately, research is viewed by many people with much skepticism. There are always those who believe that no further advances in a particular field are possible. Men who think soundly and conservatively are a boon to any business, but Heaven help the industry that lacks a goodly mixture of men with imagination. We have come to the dawning of a day when there is a new respect and a greater appreciation for research than ever existed before. Leaders in many lines of activity have discovered that scientific investigation is the most effective weapon available to them in defending their businesses against false accusations and unjust attacks."

All of the foregoing is directed at the gas industry and the appeal winds up with the inquiry, "Why do we wait?"

As for the general attitude of the manufacturing world, we have it on the authority of the Chamber of Commerce of the United States that American Industry is spending $70,000,000 annually on scientific research. About one-half of this sum is spent by American manufacturers in the conduct of laboratory researches, while the remainder is expended in experimental and development work in plants. As a result of scientific research, it is stated, approximately one-half billion dollars is being saved annually by industry in this country.

In an equally significant statement issued by authority of the Chamber, it is declared: "The value of scientific research, both from an economic and industrial standpoint, has never been so fully appreciated as at the present time. The problems of the recent war forced science and its research activities to the front in all civilized countries. It is now realized by leading manufacturers that scientific investigation is a necessary adjunct to efficient cooperation. . . . It is not surprising, therefore, that a continually increasing number of trade associations are realizing the value of research as one of their most constructive activities."

These are pretty strong statements and may well give satisfaction to those who have worked so earnestly to place the heating and ventilating industry in its present commanding position in this respect. At the same time they constitute about as convincing evidence as could be produced to show why the support of the heating engineers' Research Laboratory means the prosperity, no less than the engineering advancement, of all connected with the industry.

SERVICE DEPARTMENT

An Arrangement for Automatically Lowering the Temperature in Idle Railroad Cars

From recently-compiled statistics, published in THE HEATING AND VENTILATING MAGAZINE for May, 1922, it was shown how much importance attaches to the problem of automatically reducing the yard or lay-over temperature in railroad cars to a predetermined temperature, say 50° F. In the article referred to, it was shown that cars are out of service in terminals and yards at least two-thirds of the time and with the common practice of heating these cars to an average of 80°, fully twice as much coal is used as is necessary or desirable.

It will be of interest to know that apparatus has been designed and is now being marketed which is designed to automatically reduce the 70° or service temperature, as maintained when the train is under steam from the locomotive, to the economical temperature of 50° during the lay-over periods.

SYSTEM OF AUTOMATIC CONTROL.

A system of automatic double control has been devised (Fig. 1) in which a selector switch (piston device) connected at one end to the air line common to all passenger cars, is electrically connected at the other end to two thermostats which control the temperatures (one at 50° and the other at 70°) by means of two magnetically-operated control valves, one for each side of the car.

In operation, the selector switch selects, as its name implies, the proper thermostat to control. When the locomotive is attached, pressure being on the air line, the piston (switch) is forced forward (Fig. 2), thus placing the 70° thermostat in automatic control of the heating apparatus, but when pressure is absent from the air line, as when cars are not in train service, the spring in front of the piston forces it back to the "center position" (Fig. 3), thus placing the 50° thermostat in control.

Pressure is always on the air line when the locomotive is attached to the train, hence the 70° thermostat is always in control when the car is getting steam from the locomotive, but pressure is never on the air line, except possibly for a period of test purposes, when cars are laying over in yards, hence the 50° thermostat is in control when cars are not occupied by passengers, and the saving of coal previously wasted in terminal heating takes place automatically.

SELECTOR SWITCH ALSO ARRANGED FOR MANUAL OPERATION.

It will be noted that the selector switch is arranged with one 50° position and with two 70° positions—one automatic 70° position shown (Fig. 2), and the other 70° hand operated or "emergency" position. This arrangement is necessary as there are certain operating conditions when a car should be heated to 70° from the stationary boiler plant when the engine with its air pressure is not connected to the train.

This would be the case where a dining car is to be picked up for the immediate serving of meals, or where sleepers or other cars containing passengers lay over on terminal or depot steam supply and are picked up by passing trains; also where cars are placed on depot tracks early in the evening and are occupied by passengers for a considerable time before the locomotive is attached to the train. Postal cars are, of course, frequently occupied or worked for hours before being attached to the locomotive supply.

To meet such special conditions, the selector switch has been provided with a button, which when pulled up by hand, as shown, permits the piston in the air chamber (in which of course there is no air pressure) to move the maximum distance to its "back" position (Fig. 4), thus in disconnecting the automatic 50° thermostat circuit, and placing the 70° thermostat in automatic control of the heating apparatus.

The first presence of pressure in the air pipe forces forward the piston of the elector switch to the original 70° automatic control (See Fig. 2), allowing the button to drop down in its former position, thus again restoring the complete automatic control feature of the apparatus without any further attention.

Outside of the special conditions cited above, no manual attention is necessary in connection with this system, and at no time is air consumed in the operation of the selector switch.

MAGNETICALLY-CONTROLLED CUT-OUT VALVES.

Magnetically-operated control cut-out valves of the automatic double-control vapor system are constructed and

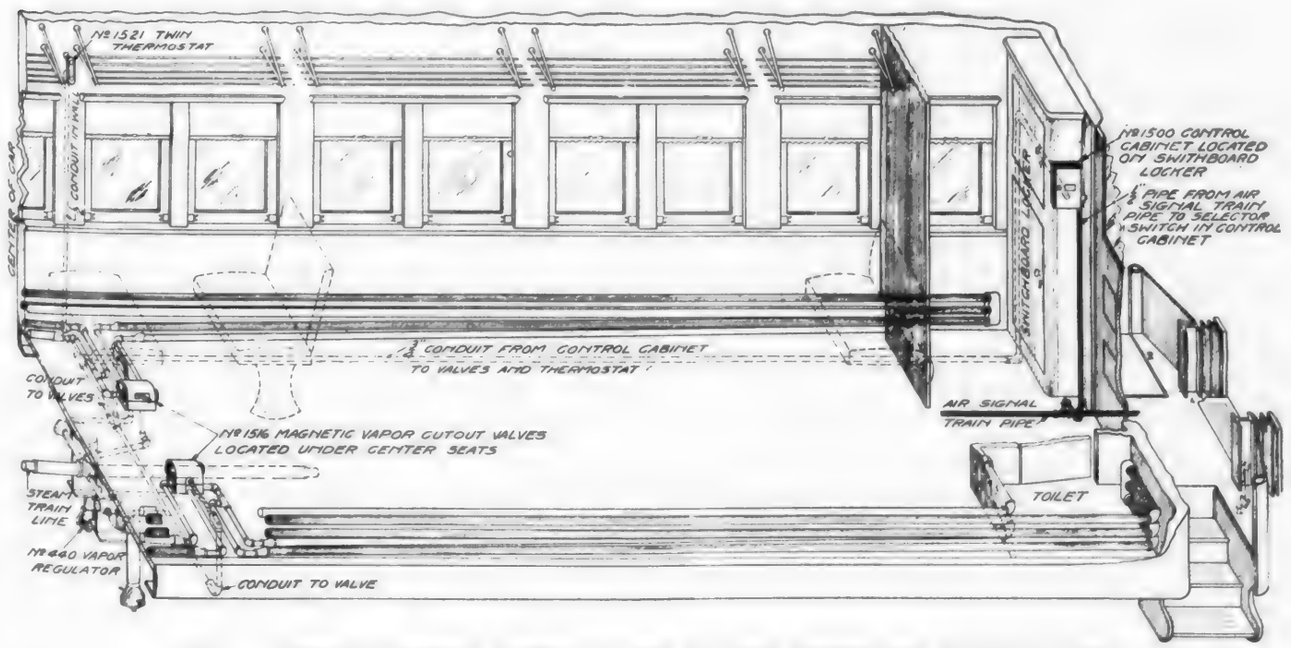

№1521 TWIN THERMOSTAT
CENTER OF CAR
1" CONDUIT IN WALL
№1500 CONTROL CABINET LOCATED ON SWITHBOARD LOCKER
SWITCHBOARD LOCKER
1/4" PIPE FROM AIR SIGNAL TRAIN PIPE TO SELECTOR SWITCH IN CONTROL CABINET
1" CONDUIT FROM CONTROL CABINET TO VALVES AND THERMOSTAT
CONDUIT TO VALVES
AIR SIGNAL TRAIN PIPE
№1516 MAGNETIC VAPOR CUTOUT VALVES LOCATED UNDER CENTER SEATS
TOILET
STEAM TRAIN LINE
№440 VAPOR REGULATOR
CONDUIT TO VALVE

FIG. 1.—AUTOMATIC DOUBLE CONTROL VAPOR HEATING SYSTEM FOR RAILWAY CARS.

operate on the same general "short-circuit" principle, with automatic drain, etc., as hand-operated cut-out valves of the same make (Fig. 5-6) which never shut off steam from the heating coils against pressure.

This is an important feature of the system, as in general, the one common difficulty to overcome in car heating is the freezing up of the drips or outlets of the apparatus when steam is turned off from the radiating surface inside the cars for the purpose of regulating temperatures. For instance, with automatic regulation, steam is shut off from the radiating pipes inside the car for periods of forty minutes to an hour, at times, and it is therefore extremely important that the outlets are protected by heat, so that freeizng will not result, and so that the system will be in proper shape to operate quickly when a lowering of the temperature automatically admits steam into the heating coils. If the outlets were not protected for this steam passes on to the short-circuit cut-out valve. There its flow is directed, either through the heating coils, thus heating the car, or the heating coils are cut out and the atmospheric pressure steam is short-circuited through the valve back to the outlet of the vapor regulator. In this way the regulator is kept in constant operation and all pipes leading to and from it warm as long as steam is on the train line, regardless of whether or not steam is being used in the coils.

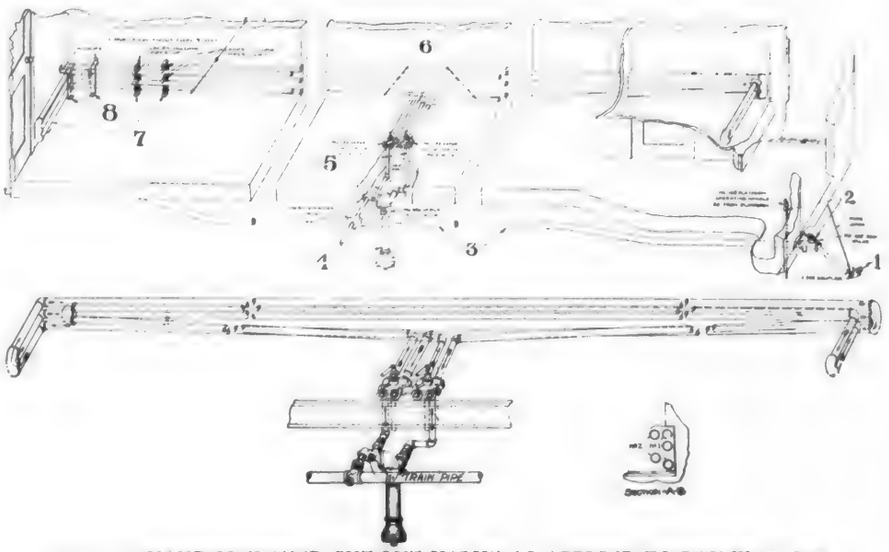


FIG. 6.—HAND-OPERATED CUT-OUT VALVE AS APPLIED TO RAILWAY CAR VAPOR HEATING SYSTEM.

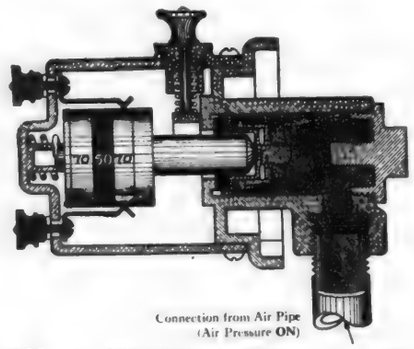


FIG. 2.—SELECTOR SWITCH AS SET WHEN LOCOMOTIVE IS ATTACHED.

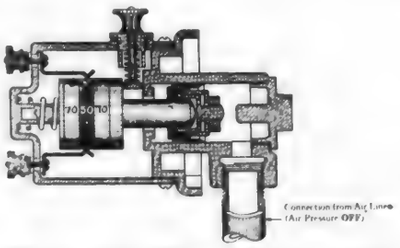


FIG. 3.—SELECTOR SWITCH AS SET WHEN CARS ARE NOT IN TRAIN SERVICE.

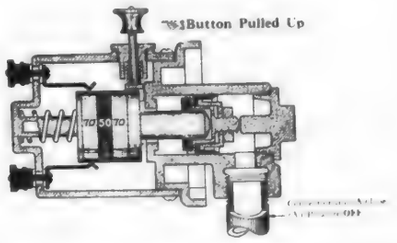


FIG. 4.—ARRANGEMENT FOR MANUAL SETTING OF SELECTOR SWITCH.

length of time they would be frozen, and the system rendered inoperative and no doubt seriously damaged.

By the use of the short-circuit method of cutting out steam from the heating coils all train line pressure ceases at the vapor regulator under the car, and after passing through this regulator, where it is reduced to atmospheric pressure, the

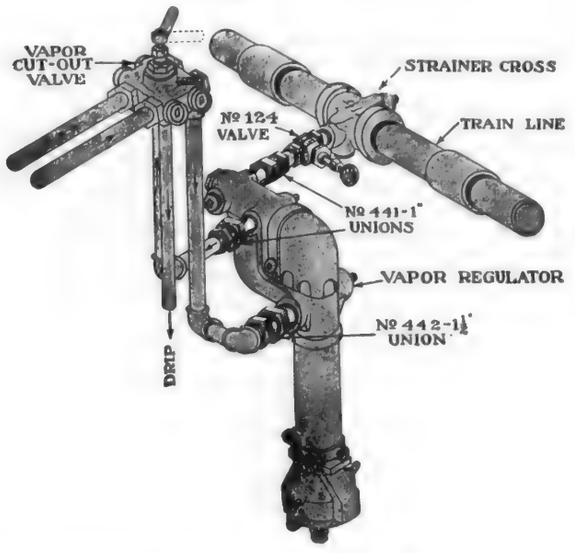


FIG. 5.—ARRANGEMENT OF HAND-OPERATED CUT-OUT VALVE.

Still another feature of the automatic double control vapor system is that in any car so equipped there is a continual flow or consumption of current from the battery of only one-tenth of an ampere per hour at the most, also the current used in the brief moments of valve operation is negligible, so that no burden is placed on the lighting system.

A temperature of 50° in passenger cars laying over at terminals is quite high enough to permit all interior washing and cleaning, insure safety from freezing of toilets and water pipes, prevent damage to finish, etc., and still leave the car warm enough so that it can quickly be raised to 70° for the accommodation of passengers when the cars go into regular train service.

Tests show that to automatically regulate the inside temperature to 50° during lay-over period in varying outside temperatures, the steam will be required to be turned on or used in the car about 25% and 15% of lay-over time for average outside temperatures of 10° and 25°, respectively.

COAL CONSUMPTION TO MAINTAIN VARYING INSIDE TEMPERATURES.

A fair ratio of coal consumption required to produce the steam condensed in terminal heating from a stationary plant

would be 1 lb. of coal to 6 lbs. of condensation. This means that it takes 5, 10 or 20 lbs. of coal per hour to heat the car to 50°, 70°, or 90°, in the order given, and, as the average temperature of steam-heated cars in the yard is considerably above 70°, it is quite likely that the average coal consumption per coach under present terminal heating conditions is at least 300 lbs. per day of 24 hours, with outside temperature of 20°.

If terminal heating of passenger cars is maintained for 180 days per year, and a car is under present terminal heating conditions two-thirds of the time, it would require about 18 tons of coal to take care of the terminal heating of one car for one heating season, under present conditions. For the more northern parts of the country more coal would be required.

From the figures already given, it is evident, that as an average over the entire county, fully twice as much coal is being used to heat passenger cars at terminals, as would be required if the temperature of the cars could be positively and constantly maintained at 50° during the lay-over period. Furthermore, as automatic control in service (70°) saves about one-third as much per hour as is saved in yard heating to 50°, the saving in coal due to such control, not only in yards, but also in service, would approximate a saving of from 15 to 20 tons per season, varying with the climatic conditions and the time the car was on terminal heating plants.

New York State Commission on Ventilation Publishes Its Report

The announcement that the report of the New York State Commission on Ventilation is now available will interest all who are engaged in the field of heating and ventilation. The work of the commission, to which the members thereof gave their time, covered a period of nearly three 3 1/2 years and was made possible through the generosity of Mrs. Elizabeth Millbank Anderson, through the New York Association for Improving the Condition of the Poor. The report, delayed as a result of the war, is published as two parts in one volume.

Part 1 deals with the laboratory experiments and researches of the commission, conducted principally in the laboratory constructed for the purpose at the College of the City of New York. This laboratory was described in THE HEATING AND VENTILATING MAGAZINE for March, 1915.

These physiological researches aimed to secure answers to the four following questions:

1. What is the effect of the overheating, such as obtains in ordinarily occupied rooms, on the bodily processes and on physical and mental efficiency?
2. What is the actual effect on the body of carbon dioxide, and the chemical substances of expired air?
3. What is the effect of exposure to drafts and to low temperatures and, in particular, what is the relation between previous overheating and subsequent exposure to cold, on respiratory, bacterial infections and on catching cold?
4. What is the actual effect of dry air at high and moderate temperatures? Does dry air harm the membranes of the nose, promote infections and conduce to nervousness?

The following may be quoted from the conclusions reached as a result of the commission's studies:

Both the physical and the chemical characteristics of air affect health and efficiency, but the physical condition of the air, particularly as it relates to its temperature, is the factor of prime importance in practical ventilation.

The appetite was found to be measurably and definitely decreased as a result of breathing stale air. This effect is not to be minimized in view of the probably significant effect on nutrition, which might result from a diminished appetite for food extending over a long period of time.

It is concluded from the experience of other investigations and from the extended researches of the commission that the primary essential for good ventilation is the maintenance of a proper air temperature, of 68° F or below, but without the production of chilling drafts. At the same time, there should be an air change sufficient to avoid the accumulation of odoriferous or other substances arising from human occupancy.

Part 2 of the report contains the plan, scope and results of the field investigations made by the commission. Of the various methods of ventilating schoolrooms, the following special types were studied, since they were either in actual use, or seemed practicable and promising:

Method 1. Rooms ventilated entirely through the use of windows.

Method 2: Rooms ventilated through the use of windows, supplemented by the use of a simple air duct or vent in the room.

Method 3: Rooms ventilated by means of fans pumping air into the rooms, supplemented by a simple air duct in the room through which air might find its own way out. This was designated as a "plenum supply, gravity exhaust" system.

Method 4: Rooms ventilated by means of fans pumping air into the rooms, with the air of the rooms being mechanically exhausted through special ducts, also by means of fans. This was called the "plenum and exhaust fan" system.

Method 5: The above *Method 4*, modified so that the said air was supplied to the room over and over again, after being re-conditioned before it was re-circulated.

It will be observed that both window and artificial ventilation were studied, also ventilation by recirculation. The characteristics, successes and failures in each are fully discussed, although no marked advantage is found in any one type of ventilating equipment as applied to all cases. This, as it is pointed out, is something which cannot be considered as constituting a criticism of the commission, but, rather, may be viewed as a challenge to all interested in the art of ventilation.

Copies of the report may be secured from the publishers, E. P. Dutton & Co., New York, or through the book department of THE HEATING AND VENTILATING MAGAZINE.

Data Pertaining to Water

The following data on water is information that the engineer frequently needs but seldom has available. While of course not original, I think it will be appreciated by readers who have no library at their command or haven't this information collected in a compact form:

One U. S. gallon has a volume of 231 cu. in. and weighs 8⅓ lbs.

One cubic foot of water at 39.1° weighs 62,426 lbs.

One second-foot means one cubic foot of water delivered per second.

One second-foot equals 7.48 U. S. gal. per second.

One second-foot equals 6.23 British gal. per second.

One second-foot equals one acre-inch per hour approximately.

Friction of water in pipes increases as the square of the velocity.

Friction of water in pipes varies inversely as the fifth power of the diameters.

Friction of water in pipes increases directly as the length.

To find the approximate theoretical horsepower required to lift water to a given height, multiply the U. S. gallons by the feet lift and divide by 4,000, making an allowance for losses in the pump.

One pound of water pressure per square inch is equal to a column of water 2.3 ft. in height.

One foot of height in a column of water is equal to a pressure of 0.434 per square inch—C. C. LONG in *Steam*.

Correspondence

A Study in Department Store Ventilation.

EDITOR HEATING AND VENTILATING MAGAZINE:

The paper in your October issue on "A Study in Department Store Ventilation" is not merely a stunt; it is not so very far from accepted practice, and in my judgment would operate with reasonable satisfaction.

While I do not subscribe without reservation to the ozone theory, I do not condemn it, as applied here, and the deodorizing effect, provided the machine shall be kept running, would in any event be appreciated.

Cloth-bag filters are decidedly effective, have been used for many years, and require only that the dirt which they gather shall be removed faithfully.

The delivery of the air at the coolest practicable temperature, through an arrangement of elbows paramount to a trap, to the local heating surfaces, meets with my hearty endorsement and is in accordance with what I believe to be advanced engineering. In an actual installation it might be effective to use radiators of the indirect type, laid flat, giving more free area for air passage and assisting in the diffusion effect of the 3-in. holes. The 3-in. holes are an application of the diffusing plate in common use at air washer inlets.

The consideration given to a system which will operate by gravity when fans are shut down is commendable. I have not had satisfactory results from aluminum shutters with low velocities of air, as they are not sensitive enough. This is, however, a mechanical difficulty, not potent against the scheme.

I apprehend that the people about half way between the inlets and the outside may not get a great deal of fresh air; being warmer and lighter, the air might tend to run along the ceiling until affected by the cooling surfaces. However, there will undoubtedly be a lively air movement at the breathing line in a certain zone where the air reverberates, from the shock of striking the ceiling, and an excellent air movement may possibly be obtained everywhere. I am convinced from experience that a better result may be anticipated from the plan suggested for the inlet than would be obtained from the conventional horizontal discharging openings.

Chicago, Ill. S. R. L.

The Way Towards Utopia.

EDITOR HEATING AND VENTILATING MAGAZINE:

Through your Economic Machine, may we conserve the coal supply for this winter, promote comfort and do good?

The question may arise among your many readers—where is our commission or profit? Well, I am sure you want to serve and benefit your constituency in every way that you can, and as for me, I will take my reward in heaven—though a deferred one.

Now while there are many defects and inaccuracies in our heating and ventilating systems, yet I will deal mainly with the questions of economy and heating; plants and furnaces.

I will take a five-room residence for my illustration, although the principles may be used in all buildings, business houses and residences. I claim that heating furnaces, which are enormously popular, are installed wrong; most of them not giving results nor satisfaction, plus plenty of heat.

Furnaces are usually installed near the end or side of the building, which forces the air to travel a long way, almost on a level or hozitonal, which is contrary to natural laws. The tendency of hot air is to rise rather than to travel on a level and that against a current of cold air coming in under doors and cracks of windows.

The furnace should be located as near the center of the house as possible for many reasons. One is, it would give off heat from itself which would be well distributed over the basement and would keep it warm and dry. The hot air in the pipes wouldn't have to travel so far. Furnaces should also be placed low so as to give the pipes an upward slope of at least 45°.

Most people keep both their residences and business houses, schools, churches and theatres too warm for health or comfort. Over-heating pleases most people for they think that they are getting their money's worth.

I know a concern that is making a specialty of re-installing furnaces and has much to do, and I learn that this firm is largely carrying out the ideas here advocated.

Now, here is a suggestion to people who have already installed their furnaces and don't care to change them. Just place a fan at the mouth of the air feed pipe and force a current through the furnace in spite of all the manifold obstacles. A small fan will suffice for a small house and will cost about two cents a day to operate.

WOULD REDUCE OUTDOOR TEMPERATURE EXTREMES.

The time is coming, and should be now, when the extreme cold or heat in our cities will be modified and reduced a few degrees.

When we consider, on one hand, the sickness, lowered vitality, reduced production, long and many vacations, loss of sleep and poor rest at night, wouldn't an investment in a cooling and heat-reducing system be a practical investment? It wouldn't be neecessary to have cold storage, but just reduce the extreme heat or cold.

On the other hand, the cold weather is hard on both health and comfort. People are housed in public and private buildings that are hot enough for a Turkish bath. They go from this to the extreme outdoor weather, which is a sudden change and is shocking to the system. Aside from the shock and injury to health, it is uncomfortable and requires heavy clothing.

If we of Colorado find it profitable and possible to heat up all out-doors to protect our fruit crops from early spring cold weather, why wouldn't our cities find it so, when we see so much of economy, beauty, health and benefits resulting therefrom? The same plant for heating could be reversed and be used for cooling.

Denver, Colo. J. A. S.

Practice of Pittsburgh Bureau of Smoke Regulation.

EDITOR HEATING AND VENTILATING MAGAZINE:

I have read with interest the statements from the Cleveland and Cincinnati Smoke Inspection Departments in THE HEATING AND VENTILATING MAGAZINE for September on the use of up-draft heating boilers.

Within the past two years, we have permitted to be installed quite a few up-draft boilers. Our rule in the case of any new type or make of boiler or equipment is to issue a provisional permit good for such length of time as will admit of making proper tests. This rule was followed in the cases of the up-draft boilers and it was found that for such installations as were covered by the specific applications it was possible to operate within the requirements of our smoke ordinance if ordinary care were used in the firing; we did not, therefore, deem it proper to exclude up-draft smokeless boilers *as such*. It is not to be understood, however, that we give blanket permission for the installation of all types of up-draft boilers. The permission given so far includes a comparatively small number of makes.

It has been our experience thus far that the boilers already installed have been working satisfactorily, giving the bureau little, if any, more trouble than the down-draft boilers. We find it quite difficult in extreme weather or in case the fireman has a lot of other work to do in the building, to prevent firing on the lower grate of a down-draft boiler. Where this is done, of course, the chimney will smoke. As a matter of fact, in several instances, one of our inspectors when quizzing firemen about down-draft boilers was told that the lower door was too small to permit easy firing on this lower grate; so the human element must be considered in all cases. We know that an experienced fireman can fire satisfactorily almost any type of boiler, while an inexperienced man, a careless men or one who fires only when the fire is about to go out, will probably be a constant source of annoyance to the neighbors and a thorn in the flesh of the smoke inspector.

It seems to me that the troubles experienced are due in many instances to the stacks, rather than to the boilers. A study of current catalogs will show dis-

crepancies in stack sizes for the same conditions. In Pittsburgh, we have no code covering this, but decide each case upon its own merits. In my opinion, the proper way to get at the matter is to determine the total amount of draft which will be necessary at the base of the stack, see that that amount of draft is provided, and that the cross section is sufficient for the maximum demand that will be made upon it.

H. B. MELLER,
Pittsburgh, Pa. Bureau Chief.

The Smokeless Boiler Discussion.

EDITOR HEATING AND VENTILATING MAGAZINE:

In THE HEATING AND VENTILATING MAGAZINE for September, page 49, you published abstracts and opinions of the smoke ordinances and smoke inspectors of the City of Cleveland. The writer attended the meetings held before the smoke commission and urged the changing of the old smoke ordinance for the following reasons:

1. The ordinance did not permit the use of single-grate boilers for exclusive oil-burning installations.

2. The ordinance was entirely too one-sided, as it did not encourage the improvement for smokeless combustion on single-grate boilers.

3. The fuel waste sometimes encountered in double-grate boilers.

4. To refute glaring misstatements made by some double-grate boiler manufacturers, to which a reliable heating contractor could not subscribe.

Explanation of objection 1: The low-overall efficiency to be obtained with oil on double-grate boilers prohibits the use of these boilers (especially cast-iron types) for fuel-oil burning.

Explanation of objection 2: This paragraph needs no further explanation if the matter is considered with an open mind.

Explanation to objection 3: The double-grate boiler is without doubt an efficient boiler, both in the burning of smoke and coal, provided there is a steady steaming load and the right kind of man behind the shovel.

Unfortunately we do not always have zero weather, and as down-draft boilers must serve in both cold and mild weather, there is bound to be a considerable loss at certain times. The fluctuating demand of steam for heating purposes, due to the ever-changing outside temperatures, mean very irregular firing periods. Irregular periods are apt to create air holes in the upper fuel bed, permitting the inrush of cold air through the boiler.

As there are no provisions made for a storage of heat in fire bricks, etc., the cold air may chill the heating surfaces, which, in turn would cool off the valuable combustible gases, such as methane, ethane, etc. These gases all require an ignition temperature of over 1,000° F., which heat cannot be supplied from the lower grate, as in that case too much steam would be generated.

When the flue gases are loaded with carbon monoxide, it is not on account of insufficient air, but as a result of the low furnace temperatures and the poor mixing of air with the combustible gases. Also the important element of time necessary to burn smoke is sometimes lacking. This is due to the affinity of the carbon for oxygen, the carbon, in that case, burning too rapidly, resulting in the escape of unburned gases. This condition would be aggravated by the cooling effect produced by a water-cooled grate.

The above-mentioned air holes are capable of admitting cold air to such an extent that the escaping smoke may be diluted to the point of a light gray. Luminous burning of smoke (not flame-burning) in a down-draft boiler is a practical impossibility.

The ash-pit losses, due to the incomplete combustion of the coal, are sometimes so great in large installations that it might be economical to burn the coke in a single-grate boiler installed beside the double-grate bars.

Above-described conditions do not prevail on all double-grate boilers to the same extent. Cast-iron boilers with the Hawley grate have a greater tendency for larger air holes in the upper fire than meshlike grates made of castiron. Double-grate steel boilers give a greater chance for burning the combustible gases on account of the better mixing effected before the gases enter the numerous small boiler tubes (time interval).

If boiler manufacturers would design and adopt furnaces with the view point, first, of perfect combustion and, second, most effective location of the heating surfaces, we would have no smoke trouble.

In a further article, the writer will discuss the prevention of smoke, combined with efficient combustion, in a single-grate boiler.

H. M. NOBIS.

Cleveland, O.

Oil Burning in High-Pressure Boilers

In a general way, writes A. W. Patterson, vice-president of The Engineer Company, in the *New York Building Superintendent*, it may be stated that ordinary anthracite coal as used in New York at $5.00 per ton on the grate, is equivalent of ordinary Mexican fuel oil at 3½ cents per gallon. This statement is based on coal in long tons of 2,240 lbs., 12,000 B. T. U. and 60% efficiency. For the oil 18,500 B. T. U. per pound at 78% efficiency. It is quite probable that this comparison would be more in favor of oil as the quality of coal secured during times of shortage would be apt to reduce the combined boiler and furnace efficiency below 60%.

The foregoing statement is based on heat value and combustion efficiencies alone and does not take into consideration the matter of labor. The cost of handling coal and ash in New York City averages an additional cost of about $1.00 per ton of coal burned. Again in a plant where several firemen are required, labor can be saved. With oil, one man can take care of a number of boilers. From these statements coupled with known costs of coal and oil and an estimate of reduction in labor charges makes possible a very close approximation of saving which may be secured with the use of oil. One other figure may be of service in these calculations. You can safely figure on securing 3.3 HP hours per gallon of average fuel oil. Knowing the output of the boilers and the price of oil, the basic cost of oil as a fuel can be determined.

APPARATUS REQUIRED TO OPERATE WITH OIL.

The apparatus required to operate with oil are as follows:

First, a storage tank which should be as large as can be advantageously located in the available space. In any event, we believe that a capacity sufficient for not less than three weeks' run should be installed.

Second, a service tank from which is secured the immediate supply of oil while the burners are in operation. This tank may be of suitable capacity to run for possibly 10 to 18 hours.

Third, an oil pumping set. These sets are usually built up as a complete machine using two duplex steam pumps mounted on a heater with the necessary pipes, valves, regulators and safety appliances. Placing a set on a foundation and piping up for steam exhaust and oil, it is ready for operation. Separate pumps together with separate heaters may be used if the plant arrangements indicate that they are better. Ordinarily, these pumping sets are well put together and constitute a satisfactory piece of apparatus.

Fourth, is the actual burning equipment and furnace arrangements. In the case of the tanks, pumps, heaters, etc., the efficiencies and reliability are about equal for different makes, but in the application of the apparatus to the furnace, there are possibilities of wide variation in efficiencies and operating results, depending upon the care and study applied to each individual installation.

TWO BASIC SYSTEMS OF BURNING OIL.

In practice, there are two basic systems of burning oil. The first where steam or compressed air is used for atomizing the oil, known as the Steam Atomizing Equipment. Second, where oil under high pressure is forced through special nozzles, known as the Mechanical Atomizing System. Also, there are two systems of admitting air for combustion. First, through various forms of openings in brick work known as checker work and second, by the use of equipment known as air registers.

In the past, steam atomizing burners have been directly associated with checker work and the mechanical system has been directly associated with the air registers. Recently, a third system has

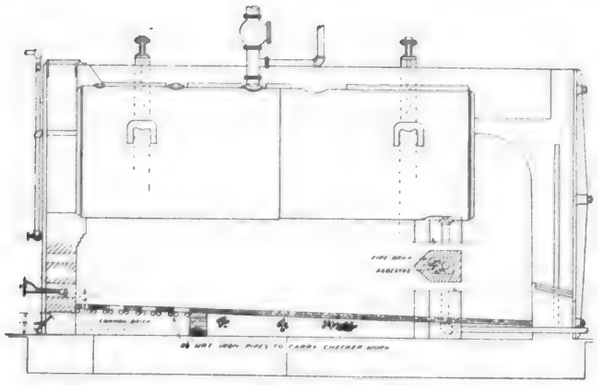


FIG. 1.—HORIZONTAL RETURN TUBULAR BOILER ARRANGED FOR FLAT FLAME CHECKER WORK BURNER.

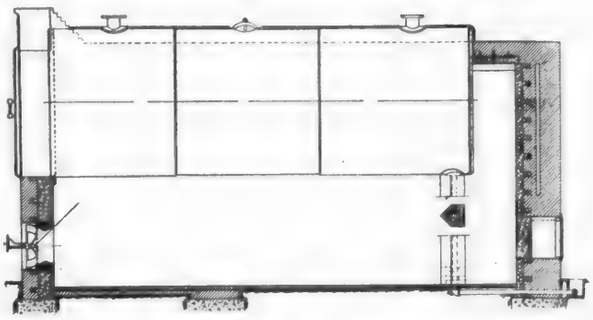


FIG. 2.—HORIZONTAL RETURN TUBULAR BOILER EQUIPPED WITH REGISTER TYPE BURNER.

been perfected whereby a steam atomizing burner has produced a hollow cone spray permitting it to be used with the air register. This third system secures the advantages of the steam automizing equipment which are flexibility, low oil pressures and temperatures and also the advantage of flame form and placement secured with mechanical burners. Further, the flame being softer in character than the mechanical spray permits operation with less draft than the straight mechanical system.

The choice of apparatus requires careful study and in fact is largely determined by the possibilities of furnace design. Believing that this discussion would be simplified by actual cases, we are offering views of typical installations actually made and running.

TYPICAL EQUIPMENTS FOR HORIZONTAL RETURN TUBULAR BOILERS.

Fig. 1 shows a horizontal return tubular boiler arranged for a flat flame checker work burner. You will note that the bridge wall has been entirely removed, making available the entire furnace which gives ample combustion volume and length for the long flame which is typical of the flat flame steam atomizing burner. The burner may be inserted close to the top of the ash pit doors. Immediately below the burner is a checker work with suitable pipe supports, the air for combusion entering through the lower part of the ash-pit doors. This arrangement with proper nozzles will secure excellent efficiencies up to possibly 150% of rating, which is probably the safe top limit for boilers of this type. When changing back to coal, it is a simple matter to tear out the checker work, build up the bridge wall and reset the grates.

A modification for lower ratings and extremely quick change from coal to oil, would be to place the burner through the firing door, building a checker work on top of the grates, using either pipe or iron bars to support the checker work and to provide suitable air admission. In this case, the bridge wall should be cut off flush with the top of the checker work, otherwise, the flame striking the bridge wall would be deflected against the shelf of the boiler with possible danger. With horizontal water-tube boilers burning oil, the blow-off pipe should always have protection.

Fig. 2 shows a horizontal return tubular boiler. In this case, a register type burner was used with steam for atomization. The furnace conditions are much the same except that the flame is softer and shorter. This equipment is adapted more to permanent installations and because of its greater efficiency, is preferable to the flat flame burner in installations where more time can be allowed for the change from oil back to coal.

TYPICAL EQUIPMENTS FOR WATER-TUBE BOILERS.

Fig. 3 shows a horizontal water-tube boiler with a flat flame checker work system, the boiler being vertically baffled. Here the problem is more complicated as the ordinary hand-fired or short stoker furnace is not deep enough to take care of the flame produced with the flat flame checker work burner. Therefore to secure desirable results with an installation of this character, it is necessary to provide furnace depth by moving back the bridge wall and making some modification of the baffles, using either an inclined baffle or possibly a flat shelf, the inclined baffle being much better, as it prevents concentration of heat at the entrance to the first pass which frequently causes considerable tube loss. Sometimes it is necessary to excavate below the present ash pit to secure suitable furnace volume, depending somewhat upon the output desired. The change back to coal involves the removal of the checker

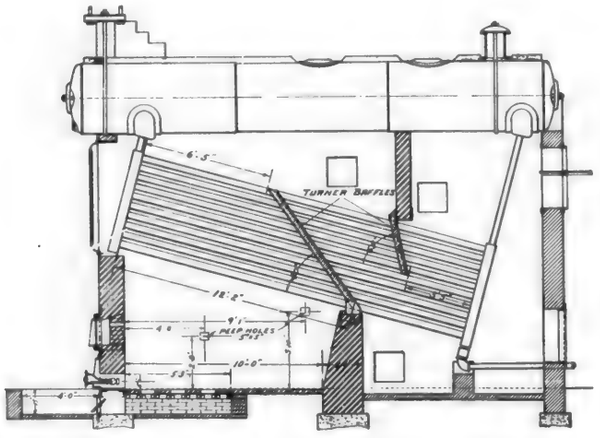


FIG. 3.—HORIZONTAL WATER-TUBE BOILER WITH FLAT FLAME CHECKER WORK SYSTEM.

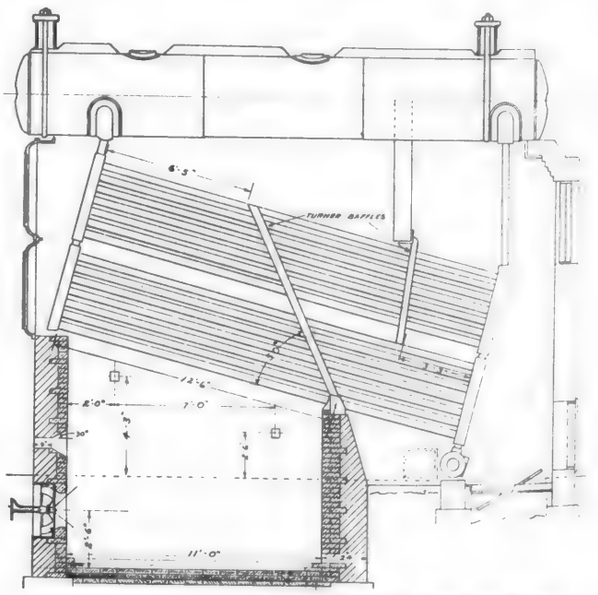


FIG. 4.—HORIZONTAL WATER-TUBE BOILER WITH REGISTER TYPE BURNER.

work and a modification of the bridge wall to suit the length of grates although a change in baffle back to the original may not be necessary.

Fig. 4 shows a horizontal water-tube boiler arranged for a register type of burner. This represents the highest type of installation and when suitable furnace volume is provided, it will operate at high ratings with safety and efficiency. The shorter flame frequently makes it unnecessary to change the bridge wall and baffles, although in any event, a deeper furnace is an advantage, but in many cases combustion volume for desirable ratings can be secured by a small amount of excavation under the boilers, or in other words, a deepening of the ash pit.

Any of the four installations shown when correctly designed should be capable of operating at efficiencies running from 76 to 78% net, after making all allowances for the cost of operating the burner and pumping and heating the oil.

The application of the mechanical system would be the same as where registers are shown.

Under normal operating conditions, a good steam atomizing system should not require more than 2% of the steam generated to pump and heat the oil and operate the burner. With the mechanical system, about 1% is required to heat the oil and pump it. Therefore, theoretically, the mechanical system should show about 1% better efficiency than a comparable steam atomizing system. As a matter of fact, it is believed that this advantage in favor of the mechanical system is more than offset by the greater care and attention which it requires and the possibilities of lower efficiency unless skillful attention is given the burner at all times.

The steam atomizing systems are much safer as they will operate at lower pressure oil and also with oil that never need be heated above the flashpoint. Therefore, any leakage would become an oil drip which would not take fire easily. In the case of the mechanical system, the oil pressure is high (anywhere from 70 to 250 lbs.) and in order to secure a proper spray, it often has to be heated above its flashpoint. Under these conditions, a leak would become a miniature burner which would ignite from a bare light or spark or might fill the fire room with an explosive mixture. The comparative safety of the steam atomizing burner is most desirable in buildings in congested districts and particularly those open to the general public.

Little Danger of Spontaneous Combustion in Coal Piles.

O. P. Hood, chief mechanical engineer of the Bureau of Mines, is authority for the statement that the risk, per ton, of spontaneous combustion in storing coal is really very small. There is no spontaneous combustion of anthracite and very rarely does the domestic consumer of bituminous coal find troublesome heating. The main interest in the subject, he states, lies in the large piles needed as reserves for public-service utilities and the industries.

Shale Oil

The United States Bureau of Mines is authority for a statement to the effect that 40% of our well-oil has already been used, and that with the increasing demand our known underground reserves will be exhausted in something like ten years. But even though this diagnosis of the situation be correct, the United States need not fear an oil famine by 1932, because we shall still possess vast deposits of oil-burning shale, which can be made to yield many times more oil than has been taken from our oil wells up to the present time. It is plain, therefore, that the oil-shale industry is bound to be exceedingly important in the near future.

The principal known deposits of oil-bearing shale occur in Colorado, Utah, Nevada and Wyoming, although there are deposits in other States also, and some of these may be more extensive than we now realize. A limited amount of oil-bearing shale is in readily accessible places, but most of it is so located that a considerable investment of money would be necessary for its development. The needed money will doubtless be available, however, as soon as the commercial practicability of winning the oil from our shale has been demonstrated.

Experiment and test have shown that there is a wide variation in the oil content of the shale, the range in commercially workable deposits being from 25 to 100 gal. of oil per ton. In addition there are useful by-products, the most important usually being ammonium sulphate. Certain other materials available as fertilizers are obtained, and there is a considerable yield of permanent (or non-condensible) gases, which are combustible, and which can be used, locally, as fuel. Variation in the processes that are employed for winning the oil will materially alter the proportions of the products that are obtained, and it is therefore necessary not only to have a definite knowledge of the composition of the shale that is to be treated, but also to study the exact details of the process that is used, in order to insure a maximum yield of marketable output.

METHOD OF RECOVERING OIL FROM SHALE.

The oil is driven off from the shale by means of heat, and the first process in the industry consists in mining the shale and preparing it for the retorts in which the heating is to be done. Some deposits can be worked with advantage by steam-shovel or open-quarry methods, but in most cases it will be necessary to conduct operations similar to those involved in coal mining.

On account of the softness or plasticity of the shale, considerable difficulty has been experienced in breaking it up into sizes suitable to be fed into the retorts. It does not fracture readily, and the ordinary crusher will not handle it satisfactorily; but it has been found that pan-mills with rotating hammers can be made to do the work quite well.

We cannot here discuss the design of the operating retorts, but we may note that it is essential to design the entire apparatus so that the raw shale can be fed into it continuously, and so that the spent or exhausted shale can be withdrawn continuously. It is also necessary to provide an effective means for keeping the shale in motion in the retorts, so that it cannot fuse together and so that all parts of it will be subjected to the same temperature-treatment. The educed (or extracted) oil-vapor should be led away and condensed as quickly as possible, because continued exposure to a high temperature tends to fix the gases permanently, and thereby reduces the marketable output.

Most shales begin to give off oil-vapor at 150° F., and the temperature to which the shale is exposed may be gradually increased up to 700° F., at which point practically all the oil has been removed. Most of it will vaporize at a temperature under 300 or 310° F., and that which is given off below this point must be removed and condensed, to avoid permanent gasification, as already noted; but it may be important to raise the temperature of the partially exhausted shale still further, in order to obtain all the combustible elements that it can give off.

By the time our American shales have been heated to 700° F., they give off, on an average, about 3,000 cu. ft. of permanent gas per ton of shale retorted. Operating at higher temperatures will increase the amount of fixed gas and reduce the amount of oil; and an easy and accurate method of controlling the temperature of the retorts is therefore essential to the successful recovery of shale oil, on a commerically profitable scale.

There is seldom any market for the permanent gas that is produced, and such gas must therefore be used at the plant or be allowed to go to waste. The fixed gas is likely to average more than 400 B. T. U. per cubic foot of gas, or 1,200,000 such units per ton of shale. Less than half of this amount of heat is needed for retorting one ton of shale, and unless the remainder can be used advantageously about the plant, it may be more economical to stop distillation before the 700° temperature is reached. The exact limiting temperature for maximum profit will depend in considerable measure upon the needs of the plant for gas as fuel, in comparison with the quantity of oil obtained from the shale.

As the hot vapors are led away from the retorts, they pass through water-heaters, condensers, and separators,—apparatus similar to that used in handling the vapors produced in by-product coke-making. The vapors emerge from the separators as crude oil, fixed gas containing naphtha and ammonia, and steam impregnated with ammonia. The ammoniacal steam is condensed, and the permanent gas is scrubbed in a tower by means of a water-spray—the ammonia water that is obtained in this way being added to that obtained by direct condensation, and the ammonia being recovered from the whole in the form of

ammonium sulphate. The gas and naphtha, after being thus freed from ammonia, are then scrubbed in another tower by means of an oil spray, which removes the naphtha and other condensible products—the emerging gas being used as fuel, while the oil is subjected to refining. The crude oil that is driven off from the shale is shipped to a refinery where it receives the same treatment that is given to crude oil that is obtained from wells.—*From the Travelers' Standard.*

Chats With Uncle Ben

The Chimney That Smoked

(From Marie to Uncle Ben)

Dear Uncle:

We, I mean the ladies' society, put a new furnace in the parsonage this summer. Here it is almost November, and last Tuesday when the preacher built a fire in it because it promised to be a cold night, it smoked so badly that they had to sleep in the barn. Smoke came up all the registers. Smoke was so thick in the cellar that the preacher's wife sent for the neighbors, thinking the house was on fire. Tom Powers, the hardware man from town who put the furnace in, says the chimney is 4 inch by 12 inch, and 35 feet high. The pipe which connects the furnace to the chimney is 31 inches around by my tape measure, and I figure that it has 78 square inches area. I wonder how they expected to make 78 inches go into 48 inches?

We can't make the preacher live in the barn all winter, and it is pretty late and cold to try to build a new chimney this Fall. Don't you think maybe we could cobble up some way to make the chimney serve? The hardware man thinks the chimney is air-tight. It runs up inside the house not outside. He made me a drawing to send you, showing how it is now ,and how he wants to try fixing it. Will you advise us?

Yours lovingly,

Marie.

(Answer by Uncle Ben)

Dear Marie:

Your poor preacher is up against a regular trick that happens very often. In the first place, a 4-in. by 12-in. chimney isn't a chimney at all. It's just a bluff at being a chimney. It's not much better than a 4-in. diameter pipe, and under some conditions it isn't as good as a 4-in. diameter pipe. I have known of several flues shaped like this, in which the hot gases would rise up in one end, while the other end showed a downdraft. If you ever had a chance to look through a smoke flue or down a chimney, you would see the gases passing along in a spiral or whirling manner, and when the flue was rectangular you would see that the corners of the flue outside the whirling circle were full of little eddies and whirls which probably retard the flow of the main current more than they help.

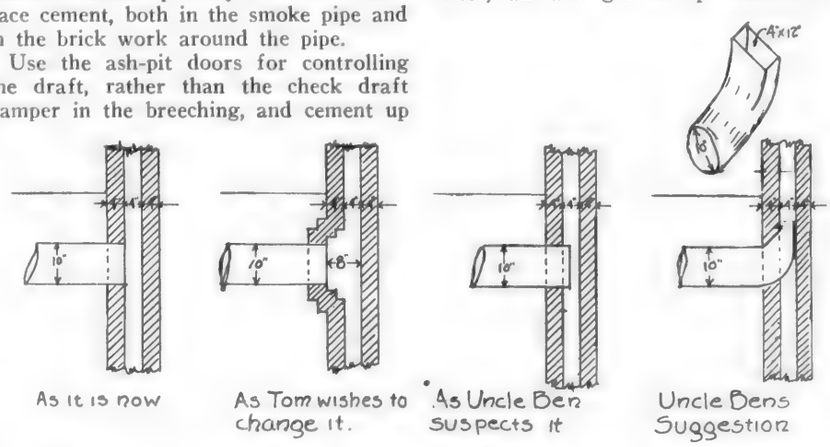
That's why I say a 4-in. by 12-in. flue isn't much better than a 4-in. round one, and I believe the only reason why so many such flues seem to serve at all is that they are usually asked to serve only a 4-in. diameter smoke pipe from a stove.

My judgment is that the preacher will have to live in the barn off and on until you get a chance to build a new chimney. When you do, by all means use a burned clay, air-tight flue lining, and have it at least 10-in. in diameter or 10-in. square inside.

The remedy suggested by Tom Powers will, of course, help the condition somewhat, especially, as is often the case, the pipe sticks too far into the chimney. A smooth tapering steel elbow, which would reduce the danger of leakage and the friction, might be installed as I have sketched it, and I think this would be better than Tom's scheme.

In a case like this, where the draft is weak, we must be exceedingly careful to prevent leakage. It would be a good idea to cement up every crack with furnace cement, both in the smoke pipe and in the brick work around the pipe.

Use the ash-pit doors for controlling the draft, rather than the check draft damper in the breeching, and cement up all leakage around this damper. There will then be less danger of gas pollution in the house.



THE CHIMNEY THAT SMOKED AND UNCLE BEN'S REMEDY.

Make sure that the chimney is tight and not porous through the attic and above the roof. Plastering the outside of a poor chimney in the attic has been known to help a bad draft over the hill. Make sure that there is an air supply for the furnace. Many a sluggish draft has been cured by heaving a lump of coal through a basement window. If you have electric current you might set a fan to blowing air into the furnace room whenever an extra demand is made. Forced draft for many ships, you know, is obtained by creating an air pressure on the entire stokehold. The only escape for the air is via the furnaces and smoke stack and they can force the fires very effectively in this way.

You might remember that your throat and your blood vessels and about all the ducts you can think of in Nature are circular. I'd admire to be shown any place where Nature uses a flue three times as long as it is wide.

Your affectionate Uncle.

New Publications.

"Analyses of Mine and Car Samples of Coal Collected in the Fiscal Years 1916 to 1919," giving the results of analyses of hundreds of coals from 25 States and Alaska, are reported in Bulletin 193, of the Bureau of Mines. The authors are Arno C. Fieldner, Walter A. Selvig and J. W. Paul. Information as to the heating values of all coals tested is also given in the bulletin, which should be of interest to all extensive users of coal fuel.

The entire distribution of Bulletin 193 will be through the Superintendent of Documents, Government Printing Office, Washington, D. C., from whom the report may be obtained at a price of 35 cents. Bulletins 22, 85 and 123, the previously issued compilations of coal analyses made by the Bureau of Mines, are sold by the Superintendent of Documents at prices of 85, 45 and 50 cents, respectively.

Republic Flow Meters for steam, water, air and gas are presented in a recent bulletin (No. 8) issued by the Republic Flow Meters Co., Chicago, Ill. In addition to a detailed description of the flow meter itself, which may be easily followed through reference to an accompanying phantom illustration, the catalogue contains views of some notable installations such as a group of 45 meters in the plant of the Goodyear Tire & Rubber Co.'s plant in Arkon, O. A separate section is devoted to a discussion of "Fundamental Principles of Republic Flow Meter." On one of the concluding pages is given a velocity chart for calculating velocities, discharge and size of pipe required for given conditions of flow. Size 7¾ x 10½ in. Pp. 36.

American Society of Heating and Ventilating Engineers

Annual Meeting to Be Held in Washington.

The next annual meeting of the American Society of Heating and Ventilating Engineers, it is announced, will be held in Washington, D. C., January 23-26, 1923. In taking this action, the society accepts the invitation of the United States Bureau of Mines to meet at the national Capital. Members of the executive committee recently visited Washington where the cordial greeting extended by Dr. L. J. Briggs, acting for Director Stratton of the Bureau of Standards and also by the Washington members assured them of the desirability of holding the meeting at that point.

Nominations of Officers for 1923.

Nominations for officers of the American Society of Heating and Ventilating Engineers for 1923 have been announced as follows:

For president, Homer Addams, New York; for first vice-president, H. P. Gant, Philadelphia; for second vice-president, E. E. McNair, Detroit; for treasurer, William H. Driscoll, New York; for members of the council, Willis H. Carrier, Newark, N. J.; Joseph A. Cutler, Chicago; S. E. Dibble, Pittsburgh; E. S. Hallett, St. Louis; Alfred S. Kellogg, Boston; Thornton Lewis, Philadelphia; J. R. McColl, Detroit; and Perry West, New York.

For members of the committee on research, the nominations are C. F. Eveleth, S. E. Dibble, F. B. Howell, Thornton Lewis and William B. Reed.

New Chairman of Guide Publication Committee.

J. E. Bolling, of the Carrier Engineering Corporation, Newark, N. J., who acted last year as secretary of the A. S. H. & V. E. Guide Publication Committee, which brought out the Guide for 1922, has been appointed chairman of the committee which will have charge of the Guide for 1923. He succeeds Perry West, whose resignation was regretfully accepted by the council.

Illinois Chapter Elects New Officers.

Officers elected at the opening meeting of the Illinois Chapter for the season of 1922-1923 are: President, Benjamin Nelson; vice-president, Charles D. Allan; secretary, H. G. Thomas; treasurer, August Kehm. Board of governors: J. A. Cutler, Homer R. Linn and William J. Mauer. Fifty-two members and guests were preesnt at the meeting at the Chicago Engineers' Club, October 9, which was preceded as usual by a dinner.

While the tellers were counting the ballots, Homer Linn introduced Robert H. Kuss who gave a talk on "Fuel for Domestic Heating Purposes." Mr. Kuss discussed the present condition in the fuel field, giving figures and data on present coal production and consumption and percentage used in the domestic field which, he stated, amounts to about 22% of the total amount. About one-half of this, or 11% is actually used for effective domestic heating, the rest being wasted.

Mr. Kuss also spoke of the present status of oil for domestic heating and said it might pay to use oil today but that, in his opinion, it would not pay in the near future. Mr. Kuss also told of the various manufactured fuels, such as briquets, peat, coke, etc., and explained the proper methods of burning various grades of fuels.

A matter of routine business brought up was the possibilty that the chapter might have to procure a new meeting place due to the fact that its present meeting night is likely to conflict with that of the Western Society of Engineers.

Among the new members elected are R. Stockenberg, G. E. Otis, W. A. Pittsford, R. E. Keyes and A. Howard Richardson.

New York Chapter Discusses Coke.

"Coke, Its Manufacure and Use" was the principal topic for discussion at the opening meeting for the season of the New York Chapter which was held October 16 at the Building Trades Employers' Club. In the absence of President W. H. Carrier, the chair was occupied by Vice-President W. L. Durand. Mr. Durand announced the following committee chairmen for the year: Membership, George C. Schmidt; Research Fund Drive, Robert W. Pryor, Jr.; meetings, A. S. Armagnac.

J. O. Lennon, New York manager for the Ilg Electric Ventilating Company, addressed the meeting on the Good Health Week campaign, his talk coming at an opportune time, as the campaign was scheduled for the following week, October 23-30.

The meeting was then turned over to Mr. Armagnac who presented the speaker of the evening, H. C. Lauber, engineer for the Seaboard By-Product Coke Company. Mr. Lauber proved himself thoroughly familiar with his subject and gave many interesting facts regarding the production of coke, taking up in detail gas-house coke, beehive coke and by-product coke.

Following his address, moving pictures were shown of the various steps in the manufacture of by-product coke by the Koppers method. A lively discussion followed the address and presentation of the pictures all of which proved of unusual interest.

A record-breaking attendance was registered, practically every seat in the meeting room being occupied. The November meeting will be devoted to the A. S. H. & V. E. Guide and the principal speaker will be J. E. Bolling who will tell of the plans for the second edition of the Guide which it is proposed to publish next Spring.

Western New York Chapter Hears Talks on Theatre Heating and Domestic Heating and Oil and Coal.

A "double bill" was presented at the opening meeting of the Western New York Chapter, at the Hotel Iroquois, Buffalo, October 3, in the form of two speakers. Gilbert Frankel, of the Buffalo Forge Company, was the first speaker, his subject being "Theatre Heating and Ventilation." Mr. Frankel dwelt upon the importance of ventilation relative to comfort and health of the patrons. He gave as four principal fundamentals in theatre ventilation:

1. Maintenance of thermic conditions of the air that will take care of heat given off by the body.

2. Sufficient quantity of air to maintain the oxygen content for breathing purposes.

3. Air practically free from dust, bacteria and injurious substances.

4. Proper exhausting of the foul air.

He called special attention to the ventilating system installed in the new Grauman Theatre, in San Francisco, which cost some $135,000. Here refrigeration is used to secure dehumidification and cooling during the warm weather.

This system recommended by Mr. Frankel, where refrigeration is not used, is one supplying fresh air from registers along the sides of the theatre, and exhausting from overhead in summer, and through mushrooms under the seats in winter, thus preventing the air from becoming adulterated with bodily odors before reaching the breathing zone, and at the same time assuring thorough distribution.

The second speaker was Joseph Harrington, of Chicago, whose subject was "Domestic Heating with Oil and Coal." Mr. Harrington told of the results procured in a typical residence installation operating with oil, in parallel with a coal-burning boiler. He compared results using Pocahontas coal, anthracite coal and kerosene oil. From a series of charts, Mr. Harrington pointed out that more uniform temperatures were obtained by burning oil and that the house heated up quicker in the morning. Burning oil, he said, meant an elimination of dust and dirt from coal and ashes and there was no odor. Tests also showed that Pocahontas coal was the most efficient, with oil next and anthracite last. This, however, was with no consideration given

to the cost of handling coal and ashes as would be required with a coal-burning boiler.

Mr. Harrington's talk was along the same lines as his paper in THE HEATING AND VENTILATING MAGAZINE for September. He stated that it was his intention to make further experiments this coming winter.

Following his talk there was an animated discussion. Frank B. Howell laid emphasis on the fact that the proper size and type of boiler and stack required for burning coal is not the same as that required for oil-burning, and until boilers and stacks are properly developed for oil-burning, a fair comparison between coal and oil could not be made.

It was planned to have future meetings of the chapter held on the first Monday evening of each month. Fifty-two members and guests were present when President C. W. Farrar called the meeting to order.

Group Heating of Buildings Taken Up by Philadelphia Chapter.

The first of the chapter discussions of "Group Heating of Buildings" which are to form a symposium for presentation at the annual meeting of the American Society of Heating and Ventilating Engineers, was scheduled for the opening meeting for the season of the Philadelphia Chapter, at the Engineers' Club, Philadelphia, October 12. The speaker was C. F. Eveleth, chief engineer for Warren Webster & Company.

Mr. Eveleth discussed four different types of group heating systems, using blackboard sketches to bring out the principal features of the various designs. He afterwards presented lantern slides illustrating a steam distribution system for a large tannery in New York State, which brought out many features in connection with methods of supporting, anchoring, and covering such lines.

Among the out-of-town guests present were Herbert C. Eicher, State Director of the Bureau of School Buildings, who is a member of the society; E. C. Evans, president of the Pittsburgh Chapter of the society and Secretary C. W. Obert, of the headquarters office in New York.

President F. D. Mensing conducted the meeting which was attended by 75 members and guests.

Directions Issued by Bureau of Mines for Burning Soft Coal in House-Heating Furnaces.

With official estimates that in the Fall and Winter season just beginning, only 60% of the normal annual supply of anthracite can be produced, and the consequent deduction that many householders who normally use hard coal must become accustomed to the manipulation of soft coal in the murky furnace depths, the Bureau of Mines has prepared instructions relative to the use of bituminous coal in house-heating furnaces.

The best substitute for anthracite, from a standpoint of cleanliness and ease of operation, is coke, declares the Bureau of Mines, but here again the supply is inadequate and the householder will have to fall back on bituminous coal. Though bituminous coal has the disadvantage of being dirty to handle, requiring more care in firing, and of giving off considerable smoke, it will be more generally available, costs less, and in the better grades which will naturally find their way to the domestic market, is higher in heat value, and contains less ash than anthracite.

Where a variety of bituminous coals are available, the householder should choose a low volatile coal. Though not necessary to have the coal sized, as is the case with anthracite, it will be found cleaner to use coal from which the fine dirt has been screened. If it is found that excessive dust is caused when firing the coal, this can be reduced by slightly wetting the coal at the front of the bin, as it is being used.

When using bituminous coal instead of anthracite in the domestic furnace, it will be necessary to use an entirely different method of firing. Instead of leveling the fuel bed and putting on fresh coal in an even layer over the entire fire box, the coked and partly burned coal remaining from the previous firing should be pushed as much as possible to one side of the fire box, and the fresh coal thrown into the empty side so as to leave some of the burning coal exposed. In this way the green coal is heated slowly, the volatile gases are given off gradually, and are ignited by the burning coal instead of going to waste up the chimney unburned.

After a little experimenting, it will be found possible, with most furnaces, to fire so that at the next firing it will be found that the bed of coke has become built up on one side of the furnace, and the other side is comparatively empty. If this can be brought about, the green coal can be thrown into the empty side without first pushing the coked coal back to one side. However, if it is desired to heat the house quickly, say on a cold morning, the coke should be broken up and pulled in an even layer across the whole grate, and be allowed to burn there until the house is heated. It can then be pushed to one side and fresh coal added.

The proper regulation of drafts varies so much with every combination of furnace, chimney, and kind of coal, that it can be determined only by trial. In general, regulate the fire as much as possible by the damper, check draft and ash pit door, not by opening the fire door wide. Immediately after firing, the fire door should be left partly open until smoking has stopped, but ordinarily the fire door grid will admit sufficient air over the fire. By opening the grid in the ash pit door, more or less, the combustion may be made more rapid or retarded. To get a hot fire the grid should be opened wide; to check the fire so as to carry it over night, it should be almost closed. The exact amount the grid is opened to produce the desired results can be determined only by trial.

Do not clean the fire oftener than necessary. For the average bituminous coal, shaking down the ashes will be required only once a day; and then shake only until the glow of the fire is seen in the ash pit, not until burning coals appear. Pull out clinkers through the clinker door from time to time.

It will be found that soot and fine ashes accumulate quite rapidly on the heating surfaces of the furnace when using bituminous coal. As such deposits interfere with efficient operation they should be removed with the scraper, through the cleaning doors at regular intervals, say once a week, or every other week.

Copies of Serial 2403, "Use of Bituminous Coal in Househeating Furnaces," may be obtained from the Bureau of Mines, Washington, D. C.

Rules Issued by Province of Alberta for Burning Soft Coal.

"Coal Truths on Handling Your Furnace" is the title of a set of instructions which are being sent out "with the compliments of the Province of Alberta, Canada." "When burning soft coal," states the circular, "If the following simple rules are kept in mind, no trouble will be had and heating results will be obtained." The circular then points out that soft coal contains a large portion of its fuel value which is burned as a gas. Taking a lesson from the gas stove, we know that gas will not burn without air and that if it is given insufficient air it will have a smoky flame. The circular then continues:

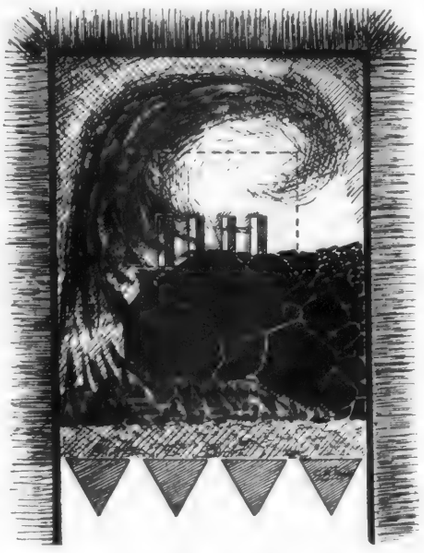


FIG. 1.—HOW TO FIRE SOFT COAL IN A SINGLE-GRATE FURNACE.

"In order to get heating results and economy you must supply air to the top of the fire.

"When you turn on the gas of the gas stove, you also use a match to light the gas. Place the coal in the fire so that the flames at one side will be the match to light the gas.

"As soft coal is much easier ignited than hard coal, less draft is required. If you have too much draft you will make

gas faster than the capacity of the combustion chamber will allow to to burn. Therefore reduce the draft to its lowest possible point by regulation of the dampers.

"In order to obtain better control over the rate of burning the coal see that some ash is left on the grate before you adjust the dampers.

"You know that if you place a spoon

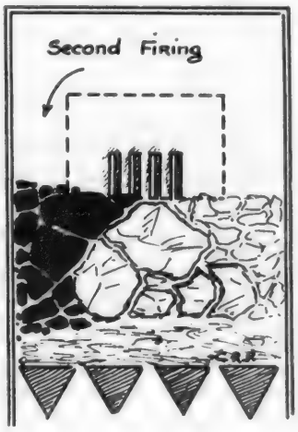


FIG. 2.—ALTERNATE METHOD OF FIRING SOFT COAL.

in the flame of a candle it will become sooted up and very little heat obtained, and that if it is held clear of the flame it will not soot and will quickly become hot. Coal in the furnace has the same effect.

"By putting in the coal as shown in Fig. 1, you provide the match to light the gas, and also lengthen the flame so that it will not soot up. Once the gas has been fully consumed it cannot make soot. It is only when partially consumed that it has the properties of making soot and smoke.

"TRY TO OPERATE THE FURNACE WITH ASHPIT DAMPER CLOSED if you cannot get results (after experimenting with the dampers and air inlet in the fire door); open the ash-pit damper slightly.

"If the weather is extremely cold or you wish to leave the fire for long period, make second firing as shown by Fig. 2. The method is known as alternate firing from side to side. You should place the lump coal as shown and fill in with the smaller coal. You will get better results by having some small than you would if using all big lumps.

"Handling the fire as instructed here, you should have no clinker troubles. Do not use the shaker too frequently. When necessary to clean the ashes from the sides of the firepot, use poker from under the grate, not through the fire door.

"Fig. 3 shows means of regulating the draft and the best position of regulators. Never put the damper in the smokepipe on the chimney side of the check."

The foregoing directions are issued over the signature of G. R. Pratt, Fuel Engineer.

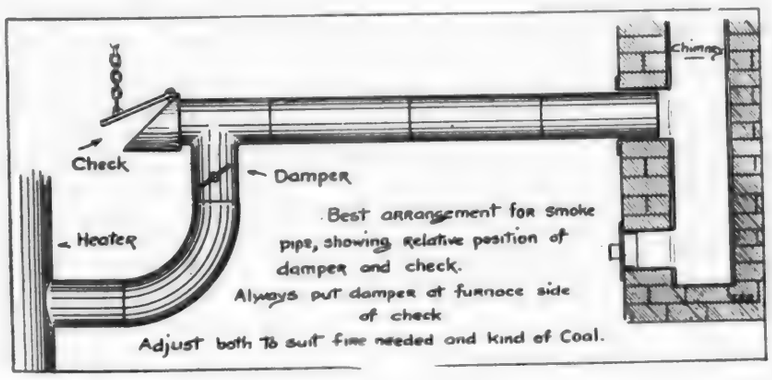

Chimney
Check
Damper
Heater
Best arrangement for smoke pipe, showing relative position of damper and check.
Always put damper at furnace side of check
Adjust both To suit fire needed and kind of Coal.

FIG. 3.—REGULATING THE DRAFT AND BEST POSITION OF REGULATOR.

Chamber of Commerce of U. S. Complete Coal Survey.

As a part of its campaign to stabilize the fuel situation through co-operative effort between the government and business, the Chamber of Commerce has completed a survey of coal supplies in the States east of the Mississippi and north of the Ohio Rivers. This part of the country has been regarded as the critical territory in the event of a coal shortage this winter. The information gathered by the chamber, which was obtained through local chambers of commerce, has been summarized as follows:

There are practically no supplies in the hands of local dealers.

Public utilities, about forty-five days.

By-product coke plants fairly well supplied.

Steel works fairly well supplied.

General industries about forty-five days.

The bituminous situation is becoming easier.

There seems to be no general complaint as to price.

The critical situation is that of securing a sufficient domestic supply in advance of cold weather, especially for the Great Lake States, and the populous areas of New York State, New England and the central Atlantic States.

There is much interest being taken in the use of oil.

There is a general increase in the use of coke for domestic fuel

Certain cities have very effective systems of gathering information and distributing their coal, while others have nothing.

The chamber has the following to say as to the amount of stocks in the hands of the retailers and regarding household supplies:

"The survey shows there are practically no stocks in the hands of the retail dealers. Reports indicate that while in most localities coal is being delivered to the householder as rapidly as received, in some localities the householder is not taking advantage of the opportunity to secure a sufficient quantity of available coal to protect himself against an emergency which would result from an early winter, with a demand for coal in excess of transportation facilities. This relates especially to bituminous coal for household use, as the anthracite is being taken as rapidly as it can be delivered.

"In the larger centers of population dependent primarily upon anthracite for household purposes, the problem of equalizing the distribution to householders of available supplies of coal is a pressing one. There is need of accurate information as to those who are well supplied and those who have little or none. Different methods have been developed for securing this information, such as statements as to stock on hand made by purchasers when ordering—or statements of deliverymen as to supplies in the bins. In New York City, under recent State legislation, the police, health and street departments have been organized to secure this information. The best method applicable to each locality for securing this information should receive the consideration of chambers of commerce in those cities confronted with the problem of securing needed supplies for householders before cold weather."

Detailed figures on production are contained in the report.

United States Coal Commission.

Following is the personnel of the newly-created United States Coal Commission which was provided for in the Borah law:

John Hays Hammond.

Thomas R. Marshall, formerly, vice-president of the United States.

Judge Samuel Anschuler, who arbitrated the labor dispute in the packing industry.

Clark Howell, editor of the Atlanta *Constitution*.

George Otis Smith, director of the United States Geological Survey.

Dr. Edward T. Devine, economist, New York.

Dr. Charles P. Neill, former Commissioner of Labor.

The commission's task will include a minute examination of the country's coal industry, after which it will report to the President and Congress with recommendations for the stabilization of the industry and for legislation to meet the immediate needs of consumers.

Impressions of the Recent Gas Convention

Industry Giving Serious Attention to House Heating by Gas as the Next Forward Step in the Development of Household Utilities

HEATING men who attended the convention of the American Gas Association in Atlantic City last month must have been struck with the spirit of expectancy which pervaded the meeting and seemed to possess manufacturer and dealer alike. It had some of the elements of a county fair as the time comes for the balloon ascension. The immediate future of the industry was on everyone's lips and most of the discussions revolved around what one speaker termed "the dawning age of gas."

As this speaker expressed it, quoting Floyd W. Parsons in the *Saturday Evening Post* who, in turn, quoted in part John C. D. Clark of the Boston Consolidated Gas Company:

"Death and the coal problem for next year and all the eternity are the only things in the future more certain than the coming of a gas age. Before many years have passed, fuel consumers in great cities, getting all their heat units through pipes, will look back in horror to the day when raw coal was burned and the people submitted to the evils of smoke, ashes, unnecessary waste and needless labor. In this coming time citizens will regard our present fuel practices very much as we regard the clumsy methods of folks a generation ago, when water was supplied to each household from a well in the back yard instead of from a central reservoir with pipes leading to all the homes in the community. It will be just as easy in the future to turn on the gas in the cellar furnace as it is now to turn on water in the bathtub.

"No one has ever discovered anything in the world that will burn except gas. We say that a piece of coal will burn, but all we do is to warm the lump to the ignition temperature, and then burn the gas that the coal liberates. Unfortunately when we carry on this process in the most efficient coal-burning furnace that was ever constructed, no way has been or will be devised to prevent the losses of coal tar, ammonia and other products of value that the coal contains. In the future, if coal is carried any distance at all, it will be to great carbonizing or gasifying plants, where the raw coal will be treated and all the values extracted, down to the last squeal. Just as whole regions will be supplied with electricity for power purposes from one great central plant, so whole regions with an area as great as some of our smaller States will be supplied with gas for heating from enormous central plants. Great mains will carry gas hundreds of miles, just as oil is now carried through pipes half way across the American continent. No modern practice is more ridiculous or more closely linked with a primitive age than our present methods of distributing and burning coal. Fortunately the next ten years will witness greater advances toward a day of fuel efficiency than have taken place during the century that has passed."

While the present prohibitive prices of gas might seem to have acted as a dampener of the delegates' enthusiasm on the subject, this was far from being the case. Reference to this point was met by a knowing look or a sly wink which seemed to say, "You just watch." Closer questioning brought out the sensational statement that big interests are now at work on a method of producing cheaper gas. Recent experiments in Chicago were cited in which powdered coal played a prominent part in the production of cheap gas. These tests, it was declared, have proven so successful that large interests are now at work planning the adoption of the process on a national scale or, to be more exact in at least 35 of the principal cities.

From Gas Industry.

AS GAS MAY BE USED UNIVERSALLY IN THE FUTURE.

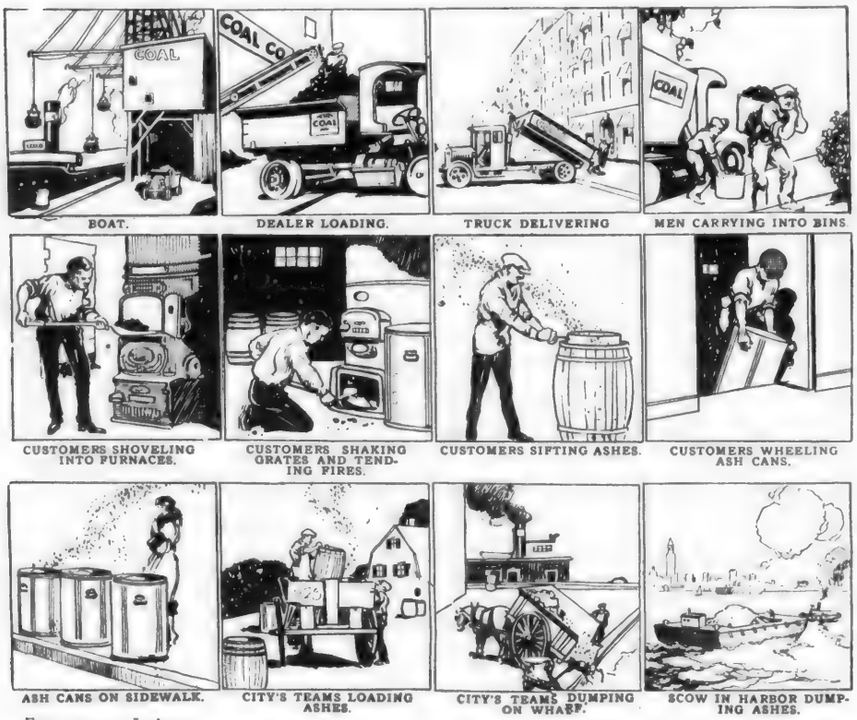
PRESENT DISTRIBUTING MAINS NOT EQUIPPED TO TAKE ON LARGE HEATING LOAD.

Inextricably connected with the expansion of the gas heating field is the matter of adequate distributing mains. Any attempt to take on a large house-heating load would mean a new or, at least, a remodeled distribution system. More than one speaker pointed out this difficulty but an answer was provided in the statement that no industry can stand still and that if the house-heating load is a desirable thing, ways and means must and will be found to meet the situation. One method suggested was to parallel the present low-pressure gas distributing mains with high-pressure lines, block off the present mains at different points and run connections at intervals between the two lines.

It should not be understood that there was no dissenting opinion on the imminence of the gas age, as applied to house heating. No less an authority than A. E. Forstall, of Mauch Chunk, came out very bluntly with the statement that, so far as his company was concerned, he hoped it would not be necessary to take on a house-heating load, largely because it would come at the time of the gas companies' present peak.

GAS INDUSTRY IN A STATE OF TRANSITION.

The facts of the matter are that the gas industry is passing through a peculiar



From Gas Industry.

AS COAL IS USED AT PRESENT.

metamorphosis. The lighting business has long since reached the point where any further growth can be expected. New homes are piped for gas for fuel only, despite all efforts of companies to secure piping for lighting. A few years ago the "cook with gas" campaign was put on and was highly successful, but it is frankly admitted that the sales efforts of placing gas ranges in present non-users' homes has reached a point of diminishing returns. Then came the water heating campaign which is still under full headway, although, from the gas company's standpoint, the use of instantaneous water heaters is "the bane of the industry" in forcing the gas companies to maintain a reserve storage (of gas), instead of the consumer maintaining his own reserve storage of (hot water).

So it is that the gas industry is in the psychological state of mind to grasp at the opportunities which seem to lie before it in connection with the heating of homes. The negative attitude on this subject is expressed in the statement that "a little calculation will readily show even the most enthusiastic the apparent futility of hoping to obtain any considerable part of this business at present rates except those parts of the country where little heat is required. There is a field here, of course, in certain classes of buildings where space is at a premium, or where heat is required for short periods or where an offset credit for labor can be figured, but in general domestic use there is a long way to travel, beset with many difficulties, before universal heating by gas may be hoped for or even anticipated with pleasure by most gas companies."

HOUSE HEATING THE LAST OF THE DOMESTIC UTILITIES TO BE MODERNIZED.

On the positive side of the situation, one of the best epitomes was expressed by E. V. Daily, manager of the gas appliance department of James B. Clow & Sons. "House heating," he said, "is the only remaining domestic utility which has not been modernized and simplified. As electricity has displaced the oil lamp, vacuum sweepers the broom, washing machines the scrubbing board, running water the family well and modern plumbing the outdoor closet, so gas must replace coal with its dust and the attending handling of fires and ashes. It is not a question of expense. We all know that electricity is more expensive than an oil lamp, a vacuum sweeper than a broom, or a gas range than a coal stove, but who would go back to them now at any cost? Let the public once realize the comforts of gas heating and the doom of coal in the home will be sealed.

"Yes, sir, put it down as a certainty that the home of the future will be heated by gas!"

Reardon Bros. Co., Lynn, Mass., heating and plumbing engineers and contractors, announces the opening of its contract department in the Manufacturers' National Bank Building for the purpose of consultation and solution of engineering problems and installations.

Legal Decisions

Valuation of Steam Heating Plant for Rate Making.

In granting the application of the Utah Power & Light Company for an increase in steam service rates the Utah Public Utilities Commission took into consideration in estimating the working capital necessary for the utility, the following items:

1. Money required to pay for coal in storage and coal used.

2. Cost of materials and supplies necessarily kept on hand for the ordinary operation and maintenance of the steam heating system.

3. Cash on hand required for taking care of operating expenses other than cost of coal, including an amount sufficient to maintain credit. Other rulings in the case were as follows:

Depreciation.—The different elements of a heating plant need replacement at different periods of time, varying from month to month, as required, and to care for these needs there must be a reserve. To accumulate this reserve, a fund must be set aside, and every consumer should stand his proper proportion of this expense. The purpose of the reserve is to keep the service continuous in the interest of the consumers, by making replacements, when and as required, and to guarantee the utility against loss of property employed in the giving of service.

Replacement of plant may be required by any one or more of several causes: Because it is worn out from use or decay, or has become inadequate or obsolete; or has been damaged or destroyed by fire or flood, or other casualty; or by reason of civic requirement and public demand.

Revenues.—To render adequate, continuous service, the revenues of heating plants arising from such services must be sufficient to cover the reasonable costs thereof. Public utility regulation contemplates that the earnings of the utility shall be reasonably remunerative, but not excessive. Sufficient revenues should accrue to cover the cost of service, including a fair return upon the fair value of the property devoted to public service.

Valuation.—The commission approved "reproduction cost" as a method of valuation to be given consideration:

Leased property used and usable exclusively for steam heating purposes was valued pon the same basis as the other property, the rental being excluded from operating expenses.

Actual unit costs, where available and shown to be reasonable, were approved in selecting a reproduction cost of the property to reflect fair value.

Combined Services.—In the case of the Hughes & Deiters Electric Company, rendering both heating and electric service, the rates were considered as a whole, because of the fact that considerable exhaust steam was sold and that it was difficult to determine accurately the amount of live steam manufactured.

Steam Heat as a By-Product.

In prescribing electric service and rates at Eureka, Montana, the Montana Public Service Commission found that the utility was, in a very small way, furnishing steam heat to other than its own buildings, the by-product from its power plant, and held that the cost to supply and revenue therefrom should be taken into account in analyzing the electric department's receipts and disbursements; and that the utility should file with the commission its rates, rules and regulations governing that special service as a separate utility.

Ventilation as a Safety Measure.

"Although we find rules and regulations being laid down for the ventilation of school houses," observes H. S. Taylor, chief engineer of the Management Engineering and Development Company, Dayton, O., speaking before the recent Safety Congress, "no concerted movement has as yet taken place to so provide for industrial plants or other structures where the greater number of our male population and a fair proportion of the opposite sex spend their working hours. To be sure, the subject of ventilation is one of importance in many industries, but study has been made and improvements perfected as an aid in the betterment of product, and not with the safety of the operators in view.

"A man who works in a poorly-ventilated department," continued the speaker, "is not at his best. Conditions may be such that they do not impair in any way his health, but at the same time they do impair his efficiency, and this impaired efficiency is a liability to the firm for which he works, and if this workman is a machine hand, where at least normal precaution must be taken to prevent accident to himself or to fellow workmen, impaired efficiency must be a reaction of this man's mental system, as well as physical, and with his mental system impaired, the quickness of those senses controlled directly from the brain that warn us of danger, fail at a critical time, and either a minor or major accident results."

The above outline was sketched to convey the principle that through the health of the workmen we can, to a great extent, improve his chances of avoiding accidents. In other words the better the health and thus the condition of the human being, the more alert his senses are to the dangers surrounding his occupation, dangers that might cause accident to him alone or to his fellow workmen as well.

Portable Unit Ventilators

EDITOR'S NOTE.—*The series of articles commencing in this issue on "Portable Unit Ventilators" is intended to supplement the series which has been running in recent issues on "Portable Unit Fan Blast Heaters." There is a distinction to be made between the two types, the former being essentially a heating unit used generally for warming large interiors, and the latter a ventilating unit, designed for such work as the heating and ventilating of classrooms and similar quarters. Previous articles in the portable unit fan blast heater series are as follows: 1—The Baetz Heater, July, 1922; 2—The Ilgair Unit Heater, August, 1922; 3—Wing-Scruplex Unit Heaters, August, 1922; 4—The Bayley Thermo-Units September, 1922; 5—"ABC" Portable Heating Units, September, 1922; 6—Sturtevant Unit Heaters, October, 1922.*

As is well known, the fuel required to heat the air for meeting ventilation standards or codes in the school to-day, exceeds the fuel required to heat the building; i. e., the cost of ventilation exceeds the cost of heating.

While ventilation is well worth all that it costs, the ventilation of unoccupied school rooms during certain periods of the day is a great waste of fuel. This is especially true where large schools are built to meet future developments of a community, or in industrial centers where a certain number of night classes are necessary, as only a few of the many rooms are occupied, but still it is necessary to run the large central fan for ventilation. At least every ten minutes sufficient outside cold air, enough to fill these rooms, is needlessly heated and then discharged through the vent stacks, all of which is unnecessary.

The unit system of ventilation has been developed partly to meet this condition. The idea is not new. It was patented in 1903 by John and William Titus, and while their apparatus was very crude, it employed all the essential elements of the present-day unit:—fan, steam radiator, deflecting damper and humidifying pan, all contained in a cabinet which takes the fresh air through the bottom of the window, tempers it and discharges it into the room.

This idea has been developed along scientific lines; the elements proportioned in accordance with standard engineering practice, and when installed by competent engineers, give excellent results.

OBJECTIONS TO UNIT SYSTEM.

There are four objections raised to the unit system of ventilation:

1. Objectionable noise in the room.
2. The floor space occupied.
3. The appearance.
4. The first cost of the installation.

The first is by no means the least formidable of these objections, not on account of any fault in the cabinet itself, but because loosely worded or incomplete specifications invite unscrupulous or incompetent manufacturer's agents to use equipment that is too small. The result is high velocity through the radiation, causing tthe frictional resistance to increase as the square of the velocity, and requiring correspondingly high fan speeds to overcome this resistance. This is the source of the noise.

The remedy to this lies not with the manufacturer, but with the architects and engineers. In any steam system, the architect or engineer specifies the size of the fan, the maximum tip speed, the maximum outlet velocity, the maximum velocity through the radiation, the minimum temperature rise at a given steam pressure, etc. The purpose of all these restrictions is the elimination of noise.

The architect or engineer must establish some such standard for the unit system of ventilation, or competitive bidding will continue to result in the installation of apparatus that is too small for satisfactory service.

Who is now setting the standard for unit ventilation?

Too often it is the manufacturer's agent without the courage of his convictions, who, fearing price competition, tries to get by with a smaller size unit by running the fan a little faster. Often he gets the contract; the school board gets a noisy apparatus, as well as a chill producer on a zero morning; while the unit system of ventilation gets a bad name or reputation in that community.

Therefore, the only cure for this situation is a standard specification limiting velocities and fan speeds and specifying the minimum temperature rise allowed with the steam pressure available.

It has required a continuous struggle on the part of the architects and engineers to keep the contractors to their specifications on mechanical equipment, and the same vigilance is required to secure the installation of satisfactory unit systems of ventilation.

AIR VELOCITIES SHOULD BE LIMITED TO 1000 FT. PER MINUTE.

An air velocity of 1,000 ft. is the maximum allowable through any unobstructed passage in the cabinet; 800 ft. is sufficient velocity through the free area of the heater. This keeps down the static resistance against which the fan must work, permitting low fan speeds.

High fan speeds are the worst sources of noise. The fan wheels are mounted directly on the motor shaft, and the slower the motor speed, the larger and more costly the motor of the same power. This has led to the use of fan wheels with backward curved blades to permit higher speed motors for the same air delivery. There has never been developed a multiblade fan wheel with straight blades, or blades curved backward at the tips which is as efficient in performance, or as quiet in operation as the very slow-speed multiblade fan with blades curved forward. The slow-speed wheel means expensive motors, but it insures quiet operation.

Low velocities through the heater keep down the resistance and permit slower fan speeds. There is no excuse for higher air velocities than 1,000 ft. any place in the cabinet, for acceleration at points of high velocity increases the resistance against the fan, thereby increasing the motor load and the noise.

PREVENTING DRAFTS WITH UNIT VENTILATORS.

To prevent drafts, the apparatus should be capable of maintaining a temperature rise of 10° F. above the room temperature with zero or 10° below zero outside temperature, according to the latitude, and at the steam pressure available. No installation should be paid for until tested for temperature rise and quantity of air delivered.

The floor space occupied is a problem for the architect or engineer to solve. In some rooms this becomes a real objection.

By exercising proper care in specifying the finish of the cabinet, all objections to its appearance can be removed.

While the first cost of the unit system is undoubtedly higher than that of the split steam, there is the saving to be considered in useless ventilation of unoccupied rooms.

The great need of the unit system of ventilation to-day is a complete architectural specification and inspection, and the cooperation of the architects in this manner will be welcomed by the manufacturers of first-class equipment.

Records Broken in Sale of Manufactured Gas.

Sales of manufactured gas for 1921 touched a new high figure of 326 billion cubic feet, an increase of 7 billion cubic feet over 1920 and 20 billion cubic feet over 1919, according to the third annual survey of the gas utilities of the United States just completed by the American Gas Association.

One of the principal factors in this increase is said by the association to be due to the growing use of gas in industrial plants during the last ten years. At the present time, the survey shows, about 22% of the total amount of gas sold is used by industry in more than 1,000 different ways.

Figures showing the domestic use of gas also reveal a remarkable increase. At the end of 1921, according to the association, 46,700,000 persons in the United States were served with gas through 69,500 miles of mains and 9,291,000 meters, the gas being used in 7,040,000 cooking appliances, 1,573,000 water heaters, 1,268,000 space heaters and 8,800,000 incandescent burners. This is an increase over 1920 of 363,000 customers, 314,000 meters, 1,000 miles of gas mains, 370,000 cooking appliances, 150,000 water heaters, and 144,000 space heaters.

Novel Applications of Electric Heaters

BY T. W. REYNOLDS

(Concluded from October Issue)

Electric heaters are often used in fire prevention work, as in boxes enclosing fire extinguishers, in hose houses built over fire hydrants, and in hose towers, to prevent mildewing and cracking of the fire hose. Fig. 14 shows a typical installation for warming valves on a sprinkler system, four heaters being mounted on a pipe standard and enclosed by protective screens of wire mesh.

ELIMINATING MOISTURE PRECIPITATION.

Since electric heaters are the only form of heating device adaptable to limited spaces, they have been widely used to keep moisture from precipitating on electric motors, as shown in Fig. 15. Objectionable conditions of this kind are particularly noticeable in underground pumping stations, because the atmosphere remains close to the dew point, thereby causing considerable precipitation of moisture with each change in ventilation, no matter how slight.

Heaters are also placed under electric locomotives so that heat may be applied when the locomotives are at rest in very wet places in tunnels. Keeping the sand in the sand boxes of street cars and industrial locomotives from caking and absorbing moisture is still another function of the electric heater.

In this connection, many other uses for electric heaters may be cited, such as keeping exposed time clocks and high voltage time switches operative, preventing moisture in oil switches, and the solution at high tension lighting arresters from freezing. Telephone switchboards, transformer cores and motors, may also be dried out, the latter as shown in Fig. 16.

These heaters have been found very useful in the central offices of the telephone industry for heating special desks, such as the wire chief's, and others used for locating troubles. Desks of this kind are affected by wet or damp weather because of the types of insulation used, such as paper, cotton and silk. Unless an even heat is provided and uniformly distributed, they absorb moisture, no matter how well they are paraffined, varnished or shellacked.

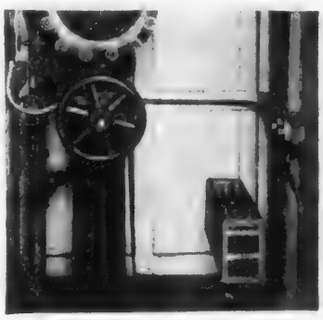


FIG. 14.—VALVE HOUSE ON FIRE EXTINGUISHER APPARATUS KEPT FROM FREEZING BY ELECTRIC SPACE HEATERS.

FIG. 13-A—THREE SPACE HEATERS MOUNTED ON A SPIDER INSIDE OF ASBESTOS CYLINDER FOR KEEPING CRUDE OIL LIQUID ENOUGH TO FLOW THROUGH STRAINER IN COLD WEATHER

The collection of moisture largely responsible for the sticking of molding sand to metal patterns can be prevented by means of electric heaters. In this way, clean, smooth castings can be produced.

Heaters can be used to good advantage in cabinets containing gummed labels, or large quantities of postage stamps which frequently get stuck together, as well as in laboratories where different powders are liable to become damp or lumpy. Salt companies use them to dry out salt.

PROVIDING EVEN TEMPERATURES FOR SCIENTIFIC INSTRUMENTS.

Electrical heat is specially suited to the keeping of sensitive instruments at proper temperatures in cold weather. Precise instruments, such as high-grade analytical balance and calorimeters for determining the heat value of coal, etc., are very sensitive to heat changes and moisture. For this reason, hot water, steam or hot air heat, would not be satisfactory.

In the manufacture of watches, the delicate operation of finishing and adjusting for heat and cold position takes place in "hot" and "cold" boxes in which the heat must be kept constant and uniform. This is now done by means of electric heaters.

FIG. 14-A.—SMALL RISER VALVE HOUSE HEATED BY SPACE HEATERS.

HOW ELECTRIC HEATERS MAY BE USED FOR DRYING.

Electric heaters are largely used for drying foundry moulds, as well as in shoe tip dryers and softeners (Fig. 17), at envelope machines (Fig. 18), and also for the drying out of pipe organs. In the rubber industry, they are used for tire ageing and quick drying of cement in the manufacture of inner tubes. The sketch in Fig. 19 shows an electric heater used with a fan in a

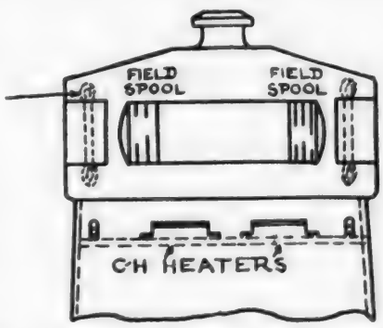


FIG. 15.—SPACE HEATERS APPLIED TO KEEP MOISTURE FROM PRECIPITATING.

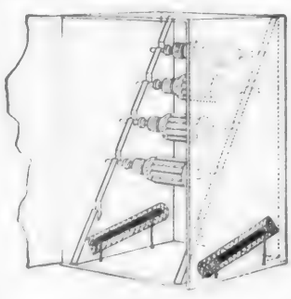


FIG. 16.—DRYING RE-WOUND MOTOR ARMATURES.

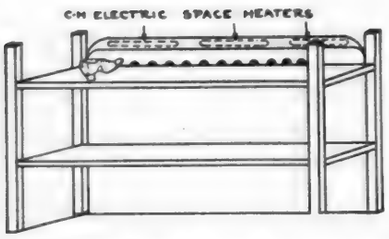


FIG. 17.—SHOE TIP DRYER EMPLOYING SPACE HEATERS.

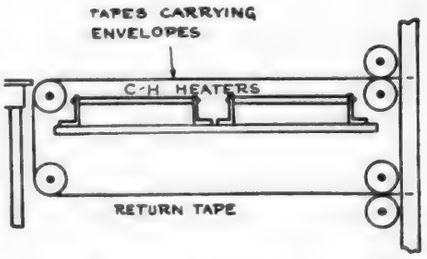


FIG. 18.—SPACE HEATERS USED ON ENVELOPE MACHINE.

film drying cabinet. In this way any degree of heat can be quickly obtained. In a similar manner they are used by photo engravers in negative cabinets, as shown in Fig. 20.

ELECTRIC HEATERS IN THE PRINTING INDUSTRY.

Paper in printing presses can be run-through much faster if electric heaters are used as they quickly dry the ink and eliminate static electricity formed by the roll paper going over the large rolls.

Two heaters are ordinarily used. On the high speed of the press motors, they are placed in multiple; but on the low speed, they are placed in series, so as to prevent burning of the paper. Fig. 21 shows how they may be applied so as to heat both sides of the paper coming from the press, thus eliminating the use of slip sheets.

SPECIAL APPLICATIONS.

Electric heaters are sometimes used for seed sprouting in green houses, and for seed testing in standard germinating chambers. Applications have also been made to germ culture ovens, japanning ovens, banana ripening, the bottom of metal clothes-washing machines (to keep the water hot), exposed watchmen's houses (Fig. 22), and unheated small offices where some heat is required.

They may be used to good advantage on ships for heating steam-operated deck winches which sometimes freeze during the winter season unless a constant steam pressure is maintained.

Portable heaters can be easily made up, as shown in Figs. 23-24; either for the double purpose of charging automobiles and general heating at any point as required, or for room heaters only, as shown in Fig. 25.

MOUNTING AND OTHER REQUIREMENTS OF ELECTRIC HEATER INSTALLATION.

When mounting in frames, electric heaters are spaced so as to allow a free

FIG. 20.—TWO SPACE HEATERS USED IN NEGATIVE DRYING CABINET.

circulation of air around them,—a distance of about 1½ in. between centers having been found satisfactory. Only ordinary screws are required for mounting because of the insulated eyelet holes.

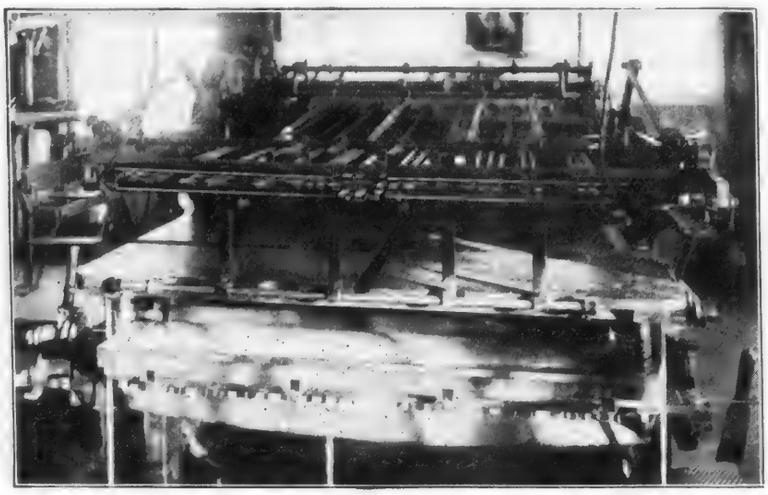


FIG. 21.—FOUR SPACE HEATERS APPLIED TO PRINTING PRESS TO PREVENT OFFSETTING.

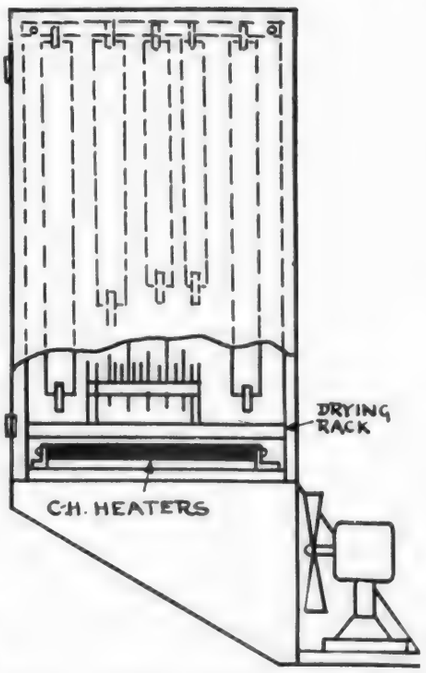


FIG. 19.—SPACE HEATER IN FILM DRYING CABINET.

Electric heaters may be connected to any direct or alternating current lighting or power circuit of 115, 230 and 250 volts pressure. Made up in the 500-watt capacity, they provide a very flexible scheme for heating. Only

FIG. 22.—WATCHMAN'S HOUSE AT ENTRANCE TO INDUSTRIAL PLANT HEATED BY ELECTRIC SPACE HEATERS.

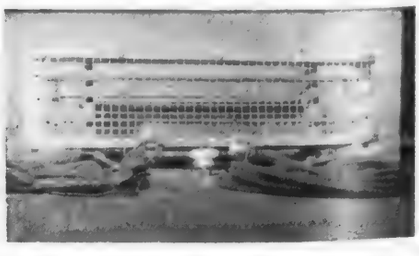


FIG. 23.—METHOD OF MAKING UP A PORTABLE HEATER CONSISTING OF THREE SPACE HEATERS WITH LONG PORTABLE CORD.

FIG. 24.—ONE END OF THE PORTABLE HEATER DESCRIBED WITH THE SNAP SWITCH FOR CONTROLING THE CIRCUIT.

as many as are actually required need be installed, yet additions can be made

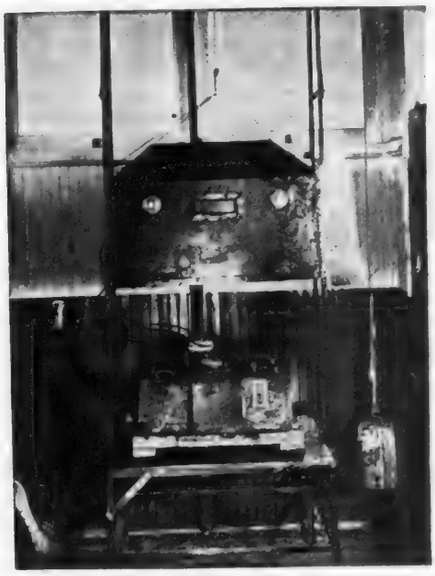


FIG. 25.—USE OF SPACE HEATERS IN OVENS FOR WARMING AND MELTING TOPS OF BATTERIES.

such as adding lamps, mounting in groups, or singly at different locations.

A Barrel of Crude Oil.

What comes out of a barrel of crude oil is visualized in an interesting way in the accompanying illustration which appeared in The Industrial Digest for September 20, 1922.

Based on a digest of oil figures compiled by the American Petroleum Institute, the statement is made that every time we use 5 gal. of gas in our cars somebody has to pump a half barrel of crude oil out of the ground. It takes nearly four barrels of oil to make one barrel of gasoline. Yet the crude oil of the United States and Mexico is produced primarily for gasoline.

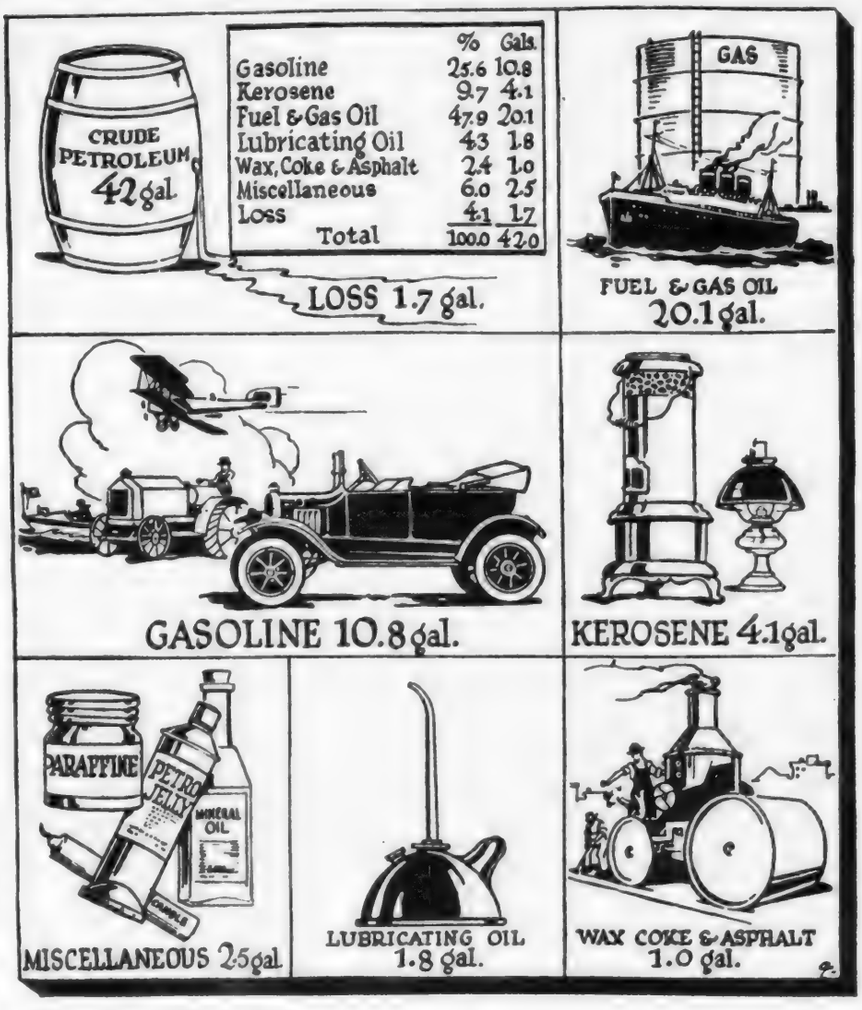
The institute's figures as compiled for 1921 show that 405,000,000 barrels of oil were used in the form of petroleum products other than gasoline. There are 42 gallons of oil in a barrel. Of these 25% goes into gasoline; 9.7% kerosene; 47.9% fuel and gas oil; 4.3, lubricating oil; 2.4 wax, coke, and asphalt; 6% miscellaneous.

Future of Gas Linked with Domestic Water Heating.

That water heating is the big field of promise for the gas interests and that the development should be with the automatic types of water heaters, rather than the circulating types, were the principal points brought out in a discussion of "Automatic Water Heating," led by C. E. Bartlett, at the recent Atlantic City convention of the American Gas Association. Mr. Bartlett presented figures showing that less than three out of every hundred consumers use more than 5000 cu. ft. of gas per month which, he said, indicated a vastly undersold market since it is only those customers who use at least 5000 cu. ft. per month who may be said to be well sold on the advantages of gas and who utilize gas to an extent that would include the hot water requirements.

"It must be recognized," continued Mr. Bartlett, "that on a straight B. T. U. comparison, coal is cheaper, but that is far from the correct way to analyze the cost of a water heating service. Hot water demands are intermittent and the fuel burned in an automatic gas heater is almost directly proportional to the water used. Thus in a family of five persons at 15 gal. per day a total water consumption of 75 gal. per day might be expected. At 2 cu. ft. to the gallon this would call for 150 cu. ft. at fifteen cents on dollar gas. This same amount of water on a strictly B. T. U. basis, allowing 12,000 B. T. U. per pound of coal, an efficiency of 50% and a temperature rise of 70° would call for 7.26 lbs. of coal which at 6 2-3 mills per pound would cost but 4.86 cents. Any one who has nursed a coal stove knows that this is not the way it works out. To maintain combustion at the rate of 7.26 lbs. of coal per day or a ton in about eight months is almost impossible and the intermittent demand coupled with the difficulty of firing prevents any such efficiency in the performance of a coal stove. In the experience of most of those having dealings with or caring for these stoves a consumption at a rate of less than a ton in four months is extremely unlikely and the majority of stoves consume between a ton in two months and a ton in three months. At these rates gas is the cheaper fuel except in the larger households."

THE PRODUCTION OF NITRIC OXIDES AND OZONE BY HIGH-VOLTAGE ELECTRIC DISCHARGES is the title of a bulletin (No. 9) recently issued by the Engineering Experiment Station of Purdue University. The authors are Karl B. McEachron and R. H. George. The material presented in the bulletin, it is stated, represents the work of the past four years spent in investigating various types of tubes in which electrical discharges are confined.



From The Industrial Digest.

WHAT COMES OUT OF A BARREL OF CRUDE OIL.

National Trade Extension Bureau

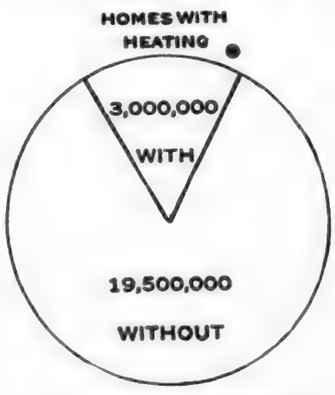
The Common Cause.

A notable service has been rendered the heating and plumbing industries through the publication by the National Trade Extension Bureau of a booklet, entitled "The Common Cause," which is designed to place before the two industries the ills of the business and to point out how these ills may be corrected. Among the points taken up are the activities of the general contractor and the need of building "trade extension" ladders in the form of proper business location, attractive stores, quality service, accurate accounting, pulling show window displays, constructive advertising, snappy sales letters, and a peppy sales organization. The purpose of the National Trade Extension Bureau is discussed at length and is epitomized as being "to make a better business man and a better merchant of the plumbing and heating dealer." Charts are included showing, for instance, that the bureau collected some $65,000 for its work in 1920 and nearly $90,000 for 1921.

Among the services rendered by the bureau are mentioned the compilation of a classified directory of plumbing and heating dealers of the United States, and educational work in the principles and the proper application of these principles for determining costs, estimating, contracting and accounting. In addition the bureau gathers data, writes literature and other copy dealing with business subjects that pertain to the heating and plumbing fields, publishes the Monthly Service Bulletin, besides preparing the subjects and material for printed lectures, etc.

Heating Possibilities.

A striking vision of the opportunities that lie before the heating industry of the country is furnished by the National Trade Extension Bureau in the accompanying chart which is based upon an exhaustive survey which the bureau has been conducting for the past two years. It represents an even greater opportunity than that existing in the plumbing field where the records show that 5,000,000 homes are equipped with plumbing and 17,500,000 are without such facilities.



HOUSE-HEATING POSSIBILITIES IN THE UNITED STATES.

A Four-Hour Day.

In an effort to show that many salesmen are actually working on what amounts to a four-hour day, the National Trade Extension Bureau presents a typical schedule of a salesman's day:

8:30 to 9:45 at the store or hotel
9:45 to 10:10 trolley car
10:10 to 10:35 with customer
10:35 to 10:50 walking
10:50 to 11:30 with prospect
11:30 to noon, trolley car
Noon to 1:00 lunch
1:00 to 1:50, fussing at store or hotel
1:50 to 2:05, trolley;
2:05 to 2:55, with customer
2:55 to 3:00 walking
3:00 to 3:10 with customer
3:10 to 3:35 trolley
3:35 to 5:40 fussing about store or hotel
5:40 left for home or quit for the day

"How many hours of work is that?" asks the bureau, "Nine hours total?"

"Not on your life," it declares, and adds, "First there is '10:10 to 10:35 with customer.' There is 25 minutes' work. Go down the list. One hundred and twenty-five minutes with customers and prospects—two hours and five minutes of work and the rest of the day gone 'blooey,' not a call in the evening either, often the best time of all for selling."

Of course, adds the circular, there are a lot of unproductive things a salesman must do. He is not to blame that all of his prospects don't live side by side on Prospect street, but are scattered all over the map. He has to spend time getting from place to place. He has to spend a few mniutes going over his mail, getting the latest dope from the manufacturer, etc.

While all of these unproductive things are essential and must be done to some extent, it is all too easy to allow them to make too big a part of his routine.

T. E. B. Monthly Service Bulletin for October, 1922, contains, among other things, a list of items included in a complete set of T. E. B. books. These include forms for use in accounting, workman's orders in pads, daily time cards, premise report cards, uniform contracts, etc.

Types of Fuel-Oil Burners For Household Use

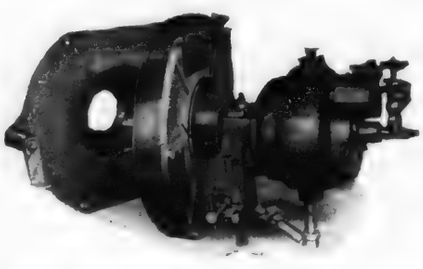
III—Ray Rotary Fuel-Oil Burners.

A product of the Far West, claimed by its designers to be the original fuel-oil burner for residence work, is the Ray rotary fuel-oil burner, developed by William R. Ray, of San Francisco, in 1915, and manufactured by the W. S. Ray Mfg. Co., San Francisco, Cal. Through its use, it is declared, many cellars of residences and hotels have been transformed from rubbish-collecting spots into billiard rooms and other rooms containing the comforts of home.

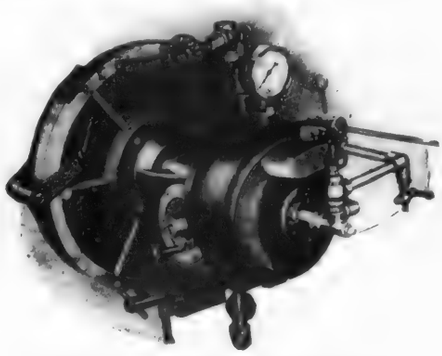
The Ray rotary burner is built to make use of the principles of atomization and combustion. It is made in 30 different sizes and for all of the various uses to which fuel-oil is adaptable. The smallest burner is operated by a ⅛-H. P. motor, and is designed primarily for use in small residences, water heaters, and for other uses requiring a small amount of heat. Burners of larger sizes are manufactured for use in hotels, restaurants, apartment houses, office buildings, laundries and power plants. The largest burner is rated at 600 H. P. capacity and is used only in the largest of boilers and in special industrial furnaces.

As described by the manufacturer, the Ray burner is the only burner that has a totally-enclosed motor, oil cooled. There is thus only one place to lubricate on the entire machine. Installation of the Ray rotary oil-burning system does not, as a rule, require any radical changes in the existing plant. The burners can be installed in all of the various types of boilers in common use.

The unique feature of the device is the method by which the fuel-oil can be deliv-



RAY PRESSURE-TYPE OIL BURNER.



RAY PUMP-TYPE OIL BURNER.

RAY LOW-PRESSURE OIL-BURNER INSTALLED IN A TYPE A IDEAL BOILER.

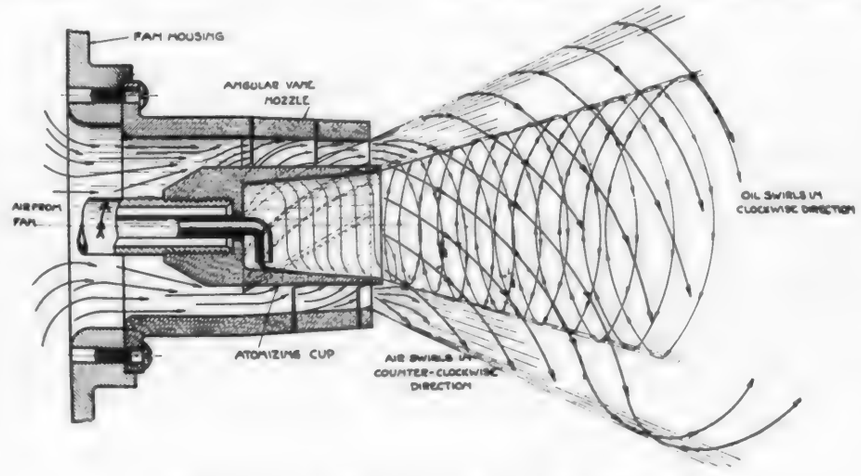
ered from the burner nozzle in one direction of rotation, while the air blast is delivered from the same nozzle in the opposite direction of rotation. The effect is produced with a single rotating member by the design of the angular vanes in the air path. The same principle applied to a centrifugal fan would result in obtaining either up or down blast at the periphery of the same fan wheel, or impeller, by simply changing the slope of the deflecting blades.

CAPACITIES OF RAY OIL-BURNERS.

Capacities of Ray burners for supplying from 400 to 14,000 sq. ft. of steam radiation, are as follows:

Capacity Steam Radiation, sq. ft.	Maximum Horse Power Developed	Maximum Capacity in Gallons per Hour	Horse Power Motor
⅛	1½ } See Note	..	400
⅛	2½ }	..	700
¼	3	6	800
⅓	5	10	1800
⅓	8	15	3000
½	15	20	5000
½	20	40	7500
¾	25	60	10,000
1	30	80	14 000

Note: These two burners use 28° Baumé oil or lighter.



PRINCIPLE OF OPERATION OF RAY OIL-BURNER.

The manner of installing storage tanks and supply lines to the burners, it is pointed out, is usually governed in the different localities by rules and regulations laid down by city or village ordinances and supervised and inspected by the fire authorities or the insurance underwriters. These regulations, as a rule, are simple and the authorities are liberal in their interpretation. The company recommends, wherever possible, the installation of a 1500-gal. storage tank outside the building line, when the lower grade fuels are to be burned. This gives adequate storage and permits the economical buying of oil in quantity lots. The smaller burners can be supplied, however, from a 500-gal. tank if oil can be readily obtained on short notice from local dealers.

New Apparatus and Appliances

Leskole Radiator Air Relief Valve.

Some novel ideas have been applied in the design of the Leskole radiator air-relief valve which, while not a thermostatic valve, still operates through the application of steam. This air valve has been adopted by the Gorton & Lidgerwood Company for use in connection with the Gorton single-pipe vapor system of heating. The bottom and top of the valve, in their normal positions, allow the free egress of air. The valve remains in this position allowing the free outflow of air until steam reaches the chamber through which the air passes and in which is contained the metal diaphragm.

When the steam comes in contact with the metal it condenses and with the accumulation of the first few drops of condensed steam or water, the agitation of this water against the diaphragm causes the diaphragm to rise, carrying with it the poppet in the bottom space. When this happens it closes the bottom hole against the admission of any further steam or water and the hole will remain closed until the steam pressure has been withdrawn. The diaphragm and poppet then resume their normal position where they remain until steam is again applied and the air accumulation driven off, as in the first instance. The operation is described as wholly automatic.

Should any foreign matter be driven through the pipes into the valve which would clog or interfere with the free operation of the diaphragm or poppet, it may be corrected by removing the screw top and moving up and down two or three times the pin which protrudes through the top of the diaphragm, after which the screw top should be replaced.

In addition to the use of these valves

LESKOLE RADIATOR AIR RELIEF VALVE.

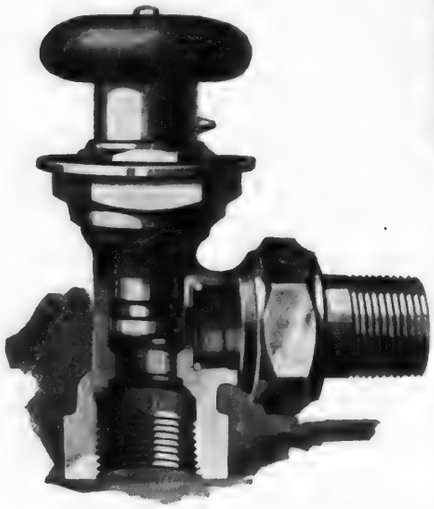
with the Gorton system, notably successful results are reported by such users as James McCullach, Inc., New York; Gunster Bros., Scranton, Pa.; and the Central Plumbing & Heating Co., Philadelphia.

Adsco Graduated Radiator Valve Now Made Packless.

A new feature of the Adsco graduated radiator valve, manufactured by the American District Steam Company, North Tonawanda, N. Y., is its packless construction which is designed to greatly increase its efficiency and durability. In addition to being made packless, the new valve is made with a black graduated dial plate with raised nickel lettering adding considerably to its general appearance. Another feature is a two-piece, "non-rising" stem designed to be free-moving, yet steam tight.

The new valve is nickeled all over. It is built in three styles, with wood hand wheel, lock and shield and lever handle. It can be used as a supply valve with any steam or vapor system because it permits close graduation, particularly on small openings, resulting in positive control of the heat. As the manufacturer states, the valve will serve with its great-

est efficiency with the Adsco system of Atmospheric steam heating in connection with the Adsco damper regulator, safety valve, mercury gauge and union elbow, with any type of boiler or steam supply line and on any suitable type of radiation. Heating contractors, it is announced, may buy these valves on a merchandise basis at a uniform price, so that it is not necessary to buy them at a "lumped" price in connection with engineering specifications. The new valve is described in a new bulletin (No. 158) which also covers the general subject of Adsco heating.



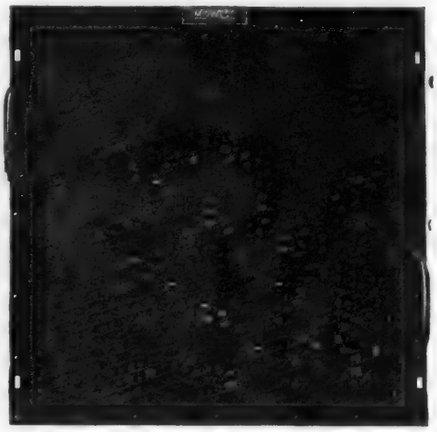
ADSCO GRADUATED PACKLESS RADIATOR VALVE.

The Midwest Unit Air Filter.

A unique type of air filter which, it is stated, utilizes an entirely new principle of air infiltration or washing, has been brought out by the Midwest Steel & Supply Co., 28 West 44h Street, New York. It is known as the Midwest unit air filter. Filters similar in design and embodying the same principles of filtration have been used extensively in Europe for the past five or six years where excellent results are reported in cleaning air for various purposes.

The air or gas to be cleaned is drawn, or, in some cases, forced through a bed of filter bodies, which consists of small special metal cylinders kept moist with a liquid called Viscosine. As the air passes through the filter bodies it changes direction many times and causes the dust particles to impinge on the inside and outside surface of the filter bodies. In this way a large quantity of dust can be caught without reducing materially the opening for the passage of air. As a result the resistance increases very slowly which will enable the filter units to remain in service a long time before having to be cleaned.

A great advantage is claimed for this equipment due to its unit-type construction, which makes it only necessary to install the exact number of units for any given quantity of air. The units can be assembled in any form or shape so as to economize in space and conform to local conditions.



MIDWEST UNIT AIR FILTER.

A filter may consist of one or more units. Each unit is 20 in. x 20 in. x 3¼ in. in size, and is composed of a frame and a cell, which is filled with the filter bodies. All units are made exactly alike. The cells are interchangeable with all frames.

Another advantage claimed for the Midwest Unit Air Filter, in addition to its cleaning efficiency, is the low cost of operation and the ease with which the filter can be maintained by unskilled labor.

For an ordinary size installation only one cell is removed at a time. (This is replaced by a reserve cell which has been previously cleaned and recharged.) At a certain set time another cell is removed and likewise replaced by a clean cell. All the cells are thus replaced in turn so that the entire filter is completely overhauled within a set period of time.

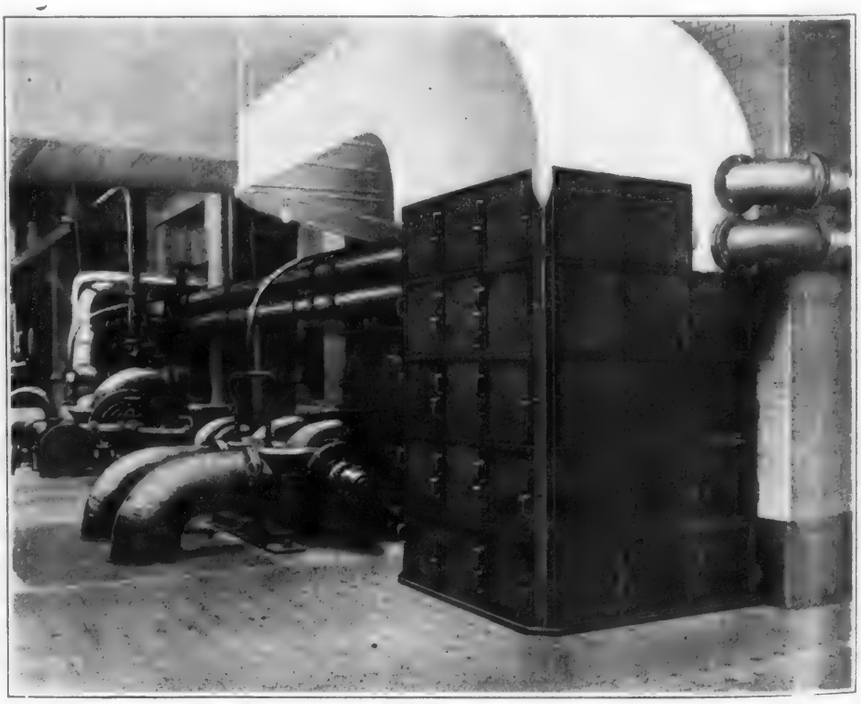
Dirty cells are washed in medium hot water containing a little soda, and after they are allowed to dry, are recharged by immersing in viscosine. When the surplus viscosine has drained off, the filter is ready for service. The cell has an expanded metal front and perforated metal back which permits the washing and charging without removing the filter bodies.

The filter is being used to clean air for various purposes, such as the ventilation of schools, banks, hospitals, etc., and for various process work at industrial plants.

A Foot-Operated Radiator Valve.

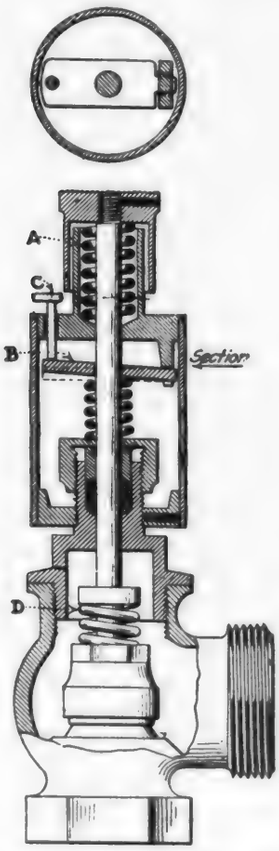
A radiator valve which may be operated, turned on or off by a pressure of the foot, on the order of a floor spring lock for a door, has been designed by P. A. Riccio, of the New York office of the Johnson Service Company. The spindle of the valve does not turn, but slides. By pressing with the foot on the cap attached to the upper end of the spindle the spring is compressed and the spindle forced down, closing the valve. A catch is provided to hold down the spindle when the foot is removed. This is an ingenious feature of the valve, consisting of a hardened tool-steel piece shown at B. When the spindle is down this little piece holds it in that position due to the fact that it is made to swing out of the horizontal, causing it to bind the spindle.

When the valve is to be opened a pressure of the foot on the small button at C places the catch in a horizontal position and the spring raises the spindle, opening the valve. To take up the slack in closing the valve a spring (D) is provided which prevents any leakage due to the slight withdrawal of the valve stem while the tongue is gripping the



TYPICAL INSTALLATION OF MIDWEST UNIT AIR FILTER IN TURBO-GENERATOR PLANT

spindle. The spindle may be stopped and held in any position in its downward travel, although when released it rises at once to the full opening. Efforts will be made to have the valve marketed



DESIGN OF FOOT-OPERATED RADIATOR VALVE.

by one of the valve manufacturers. It is already in successful use in such institutions as the Manhattan Eye, Ear and Throat Hospital, New York; and in Bellevue Hospital, New York.

Balanced Wind-Operated Ventilators For the Window.

No doubt some of our readers have noted a revolving fan mounted in a window of the Architect Samples Corporation at 101 Park Avenue, New York, where it alternates in opening and closing an automatic ventilator of the window type (Figs. 1–2), an operation repeated approximately 2200 times a week, without noise or attention. The installation constitutes an interesting demonstration of the action of balanced wind-closed louvers. These ventilators will close with even a lesser force so that all the advantages of the open window are obtained, but with draft and weather eliminated.

The principle upon which these ventilators operate is that of counter-balanced louvers, which are normally held open by lead counter-weights when there is no wind, but closing against a breeze strong enough to lift the counter-weights, thus shutting out drafts, dust, rain and snow. When closed, however, they are not air-

FIG. 1. BALANCED WIND-OPERATED VENTILATOR.

tight, but still admit sufficient air at reduced velocity to maintain circulation.

The counter-weights, which are made adjustable, so as to control the sensitiveness of the louvers to the action of the wind, are threaded on the extension of the shaft shown bent at right angles. When the weights are placed near the axis of the shaft, they cause the louvers to close with the slightest wind pressure, but when moved toward the end of the shaft, the resistance of the louvers to the wind is correspondingly increased. Added resistance may also be obtained by increasing the number of weights, so as to hold the louvers open, as might be desired during the summer months.

Fig. 1 illustrates the insert of the ventilator,—separate unit, 7 in. x 9 in., consisting of a copper frame mounting three aluminum louvers on brass pivots revolving in copper bearings. All moving parts can be removed from the room side without tools, so that cleaning can easily be done.

Ventilators of this type do not interfere with the opening, closing or locking of windows. They can be installed at the top or bottom of a window, outside or inside the sash, independent upon obstructions, such as fire shutters and awnings, so that the sash can be opened to the extent required by the ventilator. The panels on either side of the central opening can be fitted with glass to suit the taste of the user.

The ventilators, which, incidentally, are made in several arrangements to suit conditions may also be used as roof ventilators, and in the fresh air intakes and ventilating ducts of blower systems, to prevent back drafts.

FIG. 2.—TYPICAL INSTALLATION OF BALANCED WIND-OPERATED VENTILATOR.

New York State Heating Contractors in Annual Convention.

Attempts to nullify the law requiring the separation of the mechanical equipment from the gen-

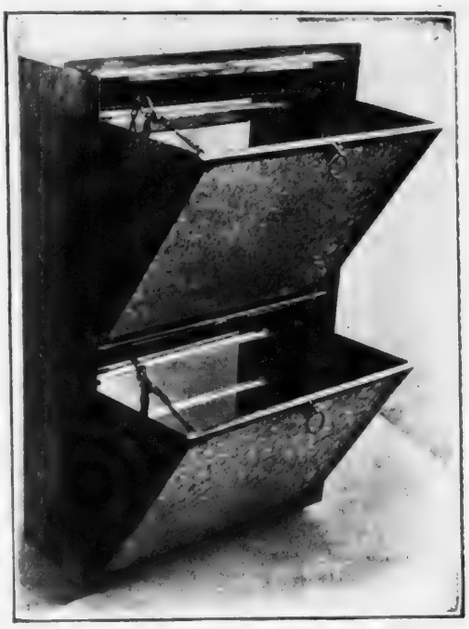


FIG. 3.—ARRANGEMENT FOR DEFLECTING INCOMING AIR.

eral contract on public work were among the principal items up for discussion at the twenty-eighth annual convention of the

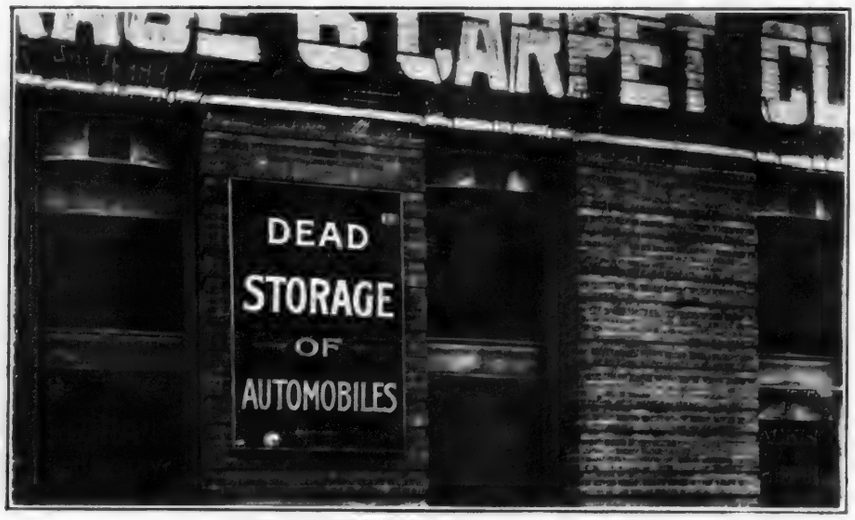


FIG. 4.—INSTALLATION OF BALANCED WIND-OPERATED VENTILATORS AS SEEN FROM OUTSIDE.

Heating and Piping Contractors' New York State Association, which was held in New York, October 19 at the national association's headquarters. In his address, President George H. Drake, of Buffalo, emphasized especially the work which the officers had done in watching legislation. As a result of their vigilance the efforts to rescind the separate contract law were rendered of no avail.

Henry B. Gombers, recording secretary of the association, in his report, gave a number of instances in which Chapter 469, Laws of 1922 of New York State, had been called to the attention of architects, with the result that separate bids were received for the various branches of the mechanical equipment. He also cited a number of instances in which architects on other work had taken bids both ways and found the separate bids to total less than the figures submitted as a portion of the lump sum bid.

The meeting discussed workmen's compensation insurance and attention was called to the fact that firms could obtain "experienced ratings" where they had been insured for three years and their record for accidents was good.

At the afternoon session the following officers were elected: President, H. W. Jones, Rochester; vice-president, D. Cady Fulmer, Syracuse; secretary-treasurer, William J. Olvany, New York. Board of directors: C. Ashmusen, Albany; George H. Drake, Buffalo; John J. Doherty, Poughkeepsie; Paul W. Schneider, Utica; J. R. Sheehan, Schenectady; and the officers of the association. Sergeant-at-arms, William G. Fraser, Buffalo.

At the conclusion of the convention, the members and guests were entertained at a dinner in the rooms of the Building Trades Employers' Association.

Death of William G. McCormick.

A shock was felt throughout the heating and plumbing trades when the news appeared in the papers of October 27 that William G. McCormick, president and editor of *Merchant Plumber and Fitter*, of New York, together with his wife, had been instantly killed in an automobile accident. According to the report as published Mr. and Mrs. McCormick were struck by a locomotive of a Long Island Railroad train near Bridgehampton, L. I. He was driving with his wife to visit friends at Sag Harbor and was crossing the tracks at the Bridgehampton Turnpike when his automobile was struck by the locomotive of a mixed freight and passenger train, known as "The Scoot." Mr. and Mrs. McCormick were thrown far and killed instantly. Letters established their identity. They leave two daughters.

"Bill" McCormick was long a familiar figure wherever heating and plumbing men were gathered together. Born in 1874, his entire business career was identified with the plumbing and heating industries. At the age of 18 he entered the employ of Ronalds & Johnson Co., of Brooklyn, now the J. D. Johnson Company. Later he joined the staff of the *Plumbers' Trade Journal*, acting as

WILLIAM G. McCORMICK
Who Was Killed In an Automobile Accident October 26.

field man for that publication for eight years.

In 1911 he left the *Plumbers' Trade Journal* to found the *Merchant Plumber and Fitter*, a semi-monthly journal now in its twelfth year, and was editor of the publication up to the time of his death. His place as president of the Merchant Plumber and Fitter Publishing Company, as well as editor, has been filled by the election of William J. Marshall, who has been associated with the publication as secretary since its inception.

Fuel combustion and power generation and utilization will have prominent places at the forthcoming National Exposition of Power and Mechanical Engineering which will be held in the Grand Central Palace, New York, December 7-13, next, during and directly following the annual meeting of the American Society of Mechanical Engineers.

DINNER OF HEATING AND PIPING CONTRACTORS' NEW YORK STATE ASSOCIATION, IN NEW YORK, OCTOBER 19.

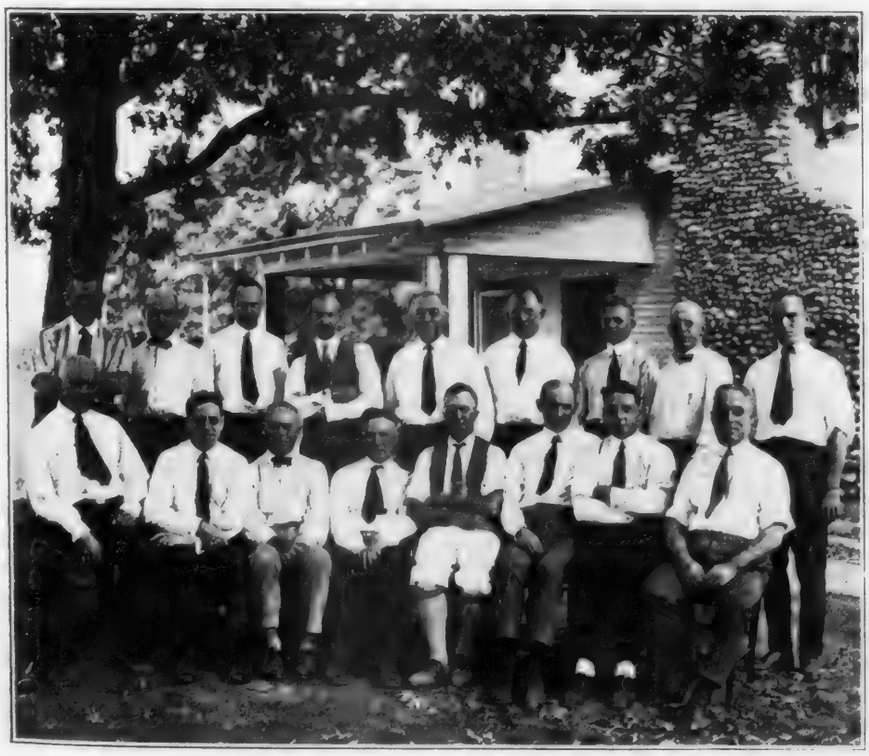
Meeting of National Association of Steam Specialty Manufacturers.

A happy combination of business and pleasure marked the semi-annual meeting of the National Association of Steam Specialty Manufacturers, which was held, on special invitation, at the Mueller Lodge, Decatur, Ill., October 5-7. All business sessions were held at the lodge where the members lived as guests of the H. Mueller Mfg. Company.

Frank A. Morrison, of the Mason Regulator Co., Dorchester Center, Mass., presided over the deliberations which had to do with standardization. A happy incident concluded the meeting when President Morrison, on behalf of the association, presented the Mueller Lodge with a chime clock in appreciation of the hospitality which had been extended the members. Adolph Mueller responded in happy vein and the meeting concluded with the singing of Auld Lang Syne.

The members' companies represented at the meeting are as follows:

Mason Regulator Co., Dorchester Center, Mass., Frank A. Morrison.
Fisher Governor Co., Marshalltown, Ia., J. H. Fisher.
Davis Regulator Co., Chicago, Ill., George C. Davis and J. C. Kinsley.
Klipfel Mfg. Co., Chicago, Ill., J. H. Swan.
Ruggles-Klingemann Mfg. Co., Salem, Mass., C. B. Klingemann.
Watts Regulator Co., Lawrence, Mass., B. E. Horne.
Schade Valve Mfg. Co., Philadelphia, Pa., Frank C. Jones.
Morehead Mfg. Co., Detroit, Mich., A. Fitzgerald and David E. Stott.



STEAM SPECIALTY MANUFACTURERS AT MUELLER LODGE, NEAR DECATUR, ILL.

Kieley & Mueller, Inc., New York City, Ernest W. Newman.
McAlear Mfg. Co., Chicago, Ill., James McAlear.
Illinois Engineering Co., Chicago, Ill., Robert L. Gifford.
H. Mueller Mfg. Co., Decatur, Ill., Adolph Mueller, Robert Mueller and W. E. Mueller.

New Trade Publications

STURTEVANT PNEUMATIC COLLECTING AND CONVEYING SYSTEMS, for collecting dust and conveying materials, are treated in an unusually comprehensive manner in Catalogue 291 of the Sturtevant Engineering Series, recently issued by the B. F. Sturtevant Co., Hyde Park, Boston, Mass. The appearance of the catalogue is especially timely as the matter of a standard code for exhaust systems is now being considered by a committee of the American Society of Heating and Ventilating Engineers, of which H. F. Hagen of the Sturtevant company is chairman. This society is acting as sponsor for the code at the request of the Federated American Engineering Societies. Part I of the catalogue contains a description of apparatus used in collecting and conveying materials, while Part II is devoted to data covering the design and application of collecting systems, and takes up no less than 23 pages. Among the items covered are directions for finding size of fan; size of main at each point; suction volume, R. P. M. and horse-power for any system; size of connections for woodworking machinery; and complete tables on the performance of Sturtevant Design 2, slow speed, low-power exhausters. There are also tables on properties of air, friction loss in pipes, and other pipe data. Size 8¼ x 10¾ in. Pp. 72.

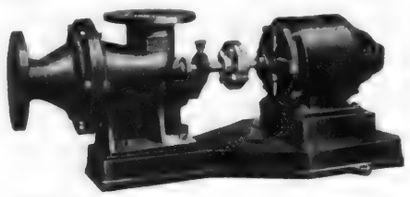
HOLMBERG SPECIALTIES FOR VACUUM-VAPOR HEATING SYSTEMS are the subject of newly-issued circular matter, issued by the Holmberg Steam Trap Co., Lindsborg, Kan., and featuring the No. 1 Holmberg quick-vent air vacuum valve designed to be used on the receiving tank in connection with the Vacuunola subdrain system, the No. 2 Holmberg vacuum-vapor vent trap for use on the end of return mains for expelling the air from the system; also the Holmberg vacuum-vapor steam trap and air eliminator. Under the title of "Golden Rules in Steam Fitting," the company suggests: 1—Give more pitch to the steam branch for each radiator or riser to the corresponding return branch; 2—Take off all steam branches with a 45° elbow at the main, connecting the corresponding return branch to the side of the return main; if necessary to nipple up the return branch, do so on the side of the main; 3—Favor all radiators that are highest up or far off from the main.

INSULATION OF ROOFS for the prevention of heat loss and condensation is discussed in a new bulletin (No. 1R) issued by the Union Fibre Co., Winona, Minn., engineers and manufacturers of insulation, including Linofelt, an insulating quilt, and Fibrofelt, an insulating panel. The bulletin treats the subject from a technical standpoint and presents data accumulated during years of experience in the insulation field. The use of this information is shown in developing a short method of solving all problems of roof insulation, so that the kind of insulation and the thickness required to prevent condensation on the inner surface of the roof under any conditions can be determined instantly. It is also possible by the use of the tabulated data to quickly calculate the saving in fuel and radiation effected by the use of insulation on a roof. Illustrations are presented of the Carrier psychrometric chart and of a roof resistance curve developed by the company. There is also a table showing the conductivity and resistance of roofs uninsulated and insulated with Fibrofelt or Lith. Size 8½ x 11 in. Pp. 12 (punched for binding).

AIR CONDITIONING (MANUFACTURED WEATHER) AND CARRIER AIR CONDITIONING EQUIPMENT are covered in a new bulletin (No. 50) issued by the Carrier Engineering Corporation, Newark, N. J., in which the latest advances in this field are brought to the attention of the engineering public. After discussing the fundamentals of air conditioning, separate sections are devoted to the moistening effect of air (regain control), the drying effect of air (drying), the heating effect of air, methods of control with special reference to the Carrier dew-point control, addition and removal of moisture from air, and the dehumidifier's dual function either as a humidifier or as a dehumidifier. The Carrier ejector system of distribution is explained and the balance of the catalogue is taken up with a description of Carrier equipment, including the conditioning machine, the rotary and pot strainers, the Carrier ejector heater, and dehumidification control. The bulletin it-

self is a notable example of the printing art as applied to the presentation of engineering literature. Size 6 x 9 in. Pp. 76.

ATLAS POSITIVE CIRCULATORS, for forced water heating systems, are described in a new bulletin (No. 2) published by the Atlas Engineering & Machine Co., Ltd., Toronto, Can. These units, it is stated, have been found useful, not only in remedying old and sluggish systems in residences, but also in large public insti-



ATLAS POSITIVE CIRCULATOR FOR FORCED WATER HEATING WORK.

tutions, hospitals, universities and apartment houses. The Atlas circulator is the invention of H. H. Angus, B. Sc., late of McMullen, Riley & Angus, consulting engineers. By overcoming the friction of flow and creating a more rapid circulation, the efficiency of a water heating boiler, of course, is largely increased. The conical-shaped impeller of the Atlas circulator is designed to permit a thorough gravity flow, if the motor should stop or be run only occasionally, as in mild weather. There is also an arrangement of deflector blades to stop the swirling action as the water leaves the impeller, thus directing the water in a straight axial flow. These pumps, it is stated, have proved themselves especially adaptable for low head work. Size of bulletin, 6 x 9 in. Pp. 4.

INTERNATIONAL HEATERS, covering the entire product of the International Heater Co., Utica, N. Y., is the title of a new general catalogue designed especially for the home owner but which will be found of equal interest to the heating contractor. It contains advice on heating equipment which a heating contractor may with profit pass on to his customers. Among the subjects discussed are what type and size heating apparatus to choose, and notes on fuels and chimneys and methods of heating. The catalogue then takes up the discussion of International Carton warm-air furnaces, International Baronet warm-air furnaces, International one-pipe heaters, International Economy boilers for steam, vapor and water heating, with notes on boiler design and efficiency, including heat absorption and evaporative power; International Economy sectional boilers, International Economy smokeless boilers, which are of the up-draft type; and International round boilers. A number of special types are also shown, such as International room heaters and one-room school heaters, heavy-duty heaters, wood-burning furnaces and hot water supply boilers. The company has also recently issued a Dealer Help Folder which is replete with suggestions for local advertising which may be used by contractors. This is described as the most elaborate booklet of its kind the company has ever published. Size of catalogue 7 x 10 in. Pp. 20. Size of Dealers' Help Folder 9 x 12 in. Pp. 44. Both publications may be had on application to the company.

THE COMPLETE LINE of Capitol boilers, United States radiators and heating specialties manufactured by the United States Radiator Corporation, Detroit, Mich., are presented in a newly-issued catalogue dated October 1, 1922. This book is an innovation over previous editions in that the size of the pages has been changed, as well as he paper stock and cover, making a small, thin, flexible volume. These features, as well as the arrangement of the text, add much to the book's convenience and usefulness for handy and quick reference. Nearly 60 pages of useful data for the heating engineer and contractor are included, this section showing special evidence of careful editing and the addition of matter based upon recent research work. Size 3¾ x 6½ in. Pp. 270.

STURTEVANT AIR WASHERS, discussed for the benefit of architects and engineers, is the subject of a new catalogue (No. 295) which has just been issued by the B. F. Sturtevant Co., Hyde Park, Boston, Mass. It is profusely illustrated and shows the various details of construction by which the air for any building or for any industry is washed and tempered before entering the building. The motors and pumps are also described and illustrated. Installations are shown in a city hall, a chocolate factory, a customs house and a theatre, as well as in other types of buildings. More than twelve pages are devoted to various tables giving dimensions, psychrometric charts, diagrams, relative humidities and other useful data. Size 8½ x 11 in. Pp. 44.

HEATING AND DEAERATION OF BOILER FEED-WATER, describing the development of an apparatus for this purpose which is about to be marketed under the name of the Cochrane vacuum deaerating heater for supplying oxygen-free water at reduced temperatures, is the subject of a treatise recently published by the H. S. B. W.-Cochrane Corporation, Philadelphia, Pa. The leaflet gives in detail an account of the experiments which led up to the design of the new apparatus and of the results obtained. Certain new charts are also presented by means of which the oxygen, nitrogen and air content of water saturated at a given temperature and pressure can be ascertained directly, without calculation; also the amount of iron or steel that such water will destroy in a year by rusting. Size 4¼ x 9½ in. Pp. 16.

SUMMER SAUSAGE DRYING, with special reference to the use of the Webster air conditioning system for this purpose, is the subject of a striking folder published by the Atmospheric Conditioning Corporation, Philadelphia, Pa. The illustrations are especially good and portray very clearly the methods employed. In connection with brine spray refrigeration, the interesting statement is made that more than 100,000 Webster brine spray nozzles are in use in packing houses throughout the United States and South America. Size 8½ x 11 in. Pp. 4.

BALLARD-SPRAGUE CONSTRUCTION SERVICE, covering boiler settings and chimneys, is presented in a new catalogue issued by Ballard, Sprague & Co., 200 Fifth Avenue, New York. Numerous examples are given of the company's work which includes the construction of chimneys, brick linings for steel stacks, repairing and heightening of brick chimneys during operation, settings for new boilers, resetting and overhauling of old boilers and the remodeling of obsolete boiler plants and installation of mechanical stokers or oil-burning apparatus. Size 6 x 9 in. Pp. 20.

PATTERSON FEED-WATER HEATERS, including the Patterson-Berryman and Standard heaters, both of the instantaneous water-tube type, are featured in a recent catalogue issued by the Patterson-Kelly Co., now located at 101 Park Avenue, New York. Either of the heaters described, it is stated, is capable of heating feed water from 40° F. to from 200° to 212°, depending upon local conditions. The shells of smaller capacities are of cast-iron and those of larger capacity are steel boiler plate. In both types the heating surface is a nest of ∩-shaped, seamless drawn copper tubing. Both ends of each tube are expanded into a forged steel tube head and each tube, it is pointed out, is free to expand and contract independently of any other tube. The Patterson-Berryman is a closed heater, as is also the Standard but the Standard heater does not have a settling chamber or purifying attachment. Instead it has a water chamber containing the water inlet and outlet openings and also compartments for directing the flow of water. New tables are included covering boiler horse powers, dimensions, etc., of each type. Size 6 x 9 in. Pp. 16.

CROSBY IDEAL VAPOR HEATING SPECIALTIES, designed by Arthur P. Crosby and manufactured by Crosby-Hessel Co., 410 South Third St., Minneapolis, Minn., are presented to the trade in a catalogue which brings out the salient features of this line in an interesting manner. The heart of the Crosby system, it is shown, is the Crosby Ideal vapor trap with which each radiator is equipped. In addition to furnishing a seal to retard the vapor in the radiator until condensed, this trap is designed to remove the air from the system by operating on the siphon principle. When condensation is formed in the radiator it flows into the trap until it rises to the top of the loop. According to the design of the trap the water then immediately begins to siphon and flow out of the trap back to the boiler until the suction of air through the small port at the top breaks the siphon and stops the flow at a certain level. This level is retained except when the heat is turned off and the trap drained. The body of water forms a water-seal and retards the vapor in the radiator until condensed. The action is repeated as soon as the trap fills again, so that there is a constant pumping on each radiator as required, thus keeping it clear of condensation and

air. The condensation flows back to the boiler and the air passes out to the atmosphere through an air ejector located at the boiler. In all instances a multiport vapor valve is used, which is of the packless type. The only other appliance used with the Crosby system is a damper controller. A separate section of the catalogue, entitled "What Others Think of Us" contains numerous fac simile letters from satisfied users, together with illustrations of buildings in which this system is installed. Size 9 x 7½ in. Pp. 32.

Si-Fo Ventilators are presented in a circular received from the Si-Fo Ventilating Equipment Co., Kirby Building, Cleveland, O. This ventilator is of the rotary type with the siphonic feature included. The circular includes the results of an interesting test conducted on a 12-inch Si-Fo ventilator. Readings were taken of the wind velocity over the roof and the air velocity through the ventilator, these being observed continuously for one hour. The average wind velocity was 4.28 miles per hour and the air discharge by the ventilator averaged 465 cu. ft. per minute. The outside temperature at the time was 41° F. while the temperature of the air entering the ventilator was 78° F. The circular also gives a list of some of the more notable installations of Si-Fo ventilators. This ventilator is made in twelve sizes, with capacities ranging from 240 to 8750 C. F. M.

W-S Vent Set for Residence and Office Ventilation

A type of ventilating unit with some novel features has just been brought out by the L. J. Wing Mfg. Co., 352-362 West 13th Street, New York. It is known as the W-S vent set and is intended for the ventilation of residence and apartment kitchens, bathrooms, etc., and also for offices, laboratories, etc. The set comprises a 10-in. Wing-Scruplex screw-propeller fan with a frame which is adjustable to the standard width of frame to fit any window

W-S VENT SET AS INSTALLED.

from 29½-in. to 42 in. wide. Care has been taken to see that the ventilator does not interfere in any way with the regular use of the window, shade or curtain. While the glass used in the frame is not transparent, it does not darken the kitchen, as it is made of prismatic glass.

This unit has a capacity of 900 cu. ft. of air per minute. The total height of the frame is 13 in; it is funished white enameled.

A Useful Pipe-Bending Chart.

Here is a chart that will be found convenient for determining the average radius of bend that should be given to common forms of pipe bends, numbers 1, 2, 3, and 4, as shown at the right, column E. Or, knowing the radius of bend, the size of pipe, and the form of bend, column D gives the expansion allowance of that bend.

For example a 5-in. pipe was made to a radius of 40 in., the bend being common U-bend as shown by No. 2 in column E. What expansion may be allowed?

The dotted line drawn across this chart shows how the chart is used.

This chart is based upon the following much-used and well-known rules:

For Bend No. 1—Square the average radius of bend in inches and multiply by 0.0026 and then divide by the outside diameter of the pipe in inches.

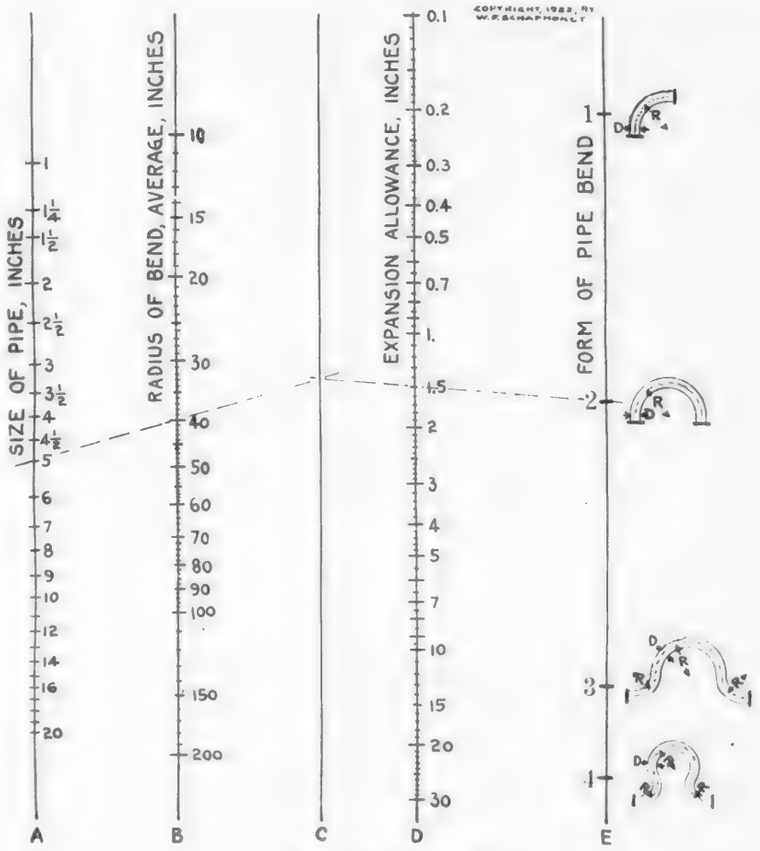
Bend No. 2—Same as No. 1 but use 0.0052 instead of 0.0026.

Bend No. 3—Same as No. 1 but use 0.0104.

Bend No. 4—Same as No. 1 but use 0.013.

In the chart all of these operations are already performed—the radii are squared, exact outside pipe diameters are employed, and the proper factors are used.

W F. Schaphorst.



PIPE BENDING CHART.

Run a straight line through the 5 column A and the 40 column B and locate the intersection with column C. Then from that point of intersection run over to the mark in column E opposite the figure 2 and the intersection through column D gives the answer as 1 5/10 in. expansion allowance.

Similarly, if the expansion allowance is already known, if the form of a bend is known, and if the size of pipe is known, the average radius to which the bend should be made may be determined in the same way. In other words, knowing any three of the four factors given in columns A, B, D and E, the fourth or unknown factor is easily determined by following the method as explained above.

Current Heating and Ventilating Literature.

GAS.

Fuel, Future Use. Gas—the Fuel of the Future, Thomson King. Am. Gas Jl., vol., 116, no. 14, Apr. 8, 1922, pp. 321-322 and 332-335. Deals with near future which can be plainly discerned and more distant future which must be dealt with in more general terms.

Proper Utilization. Proper Utilization of Gas Important, Andrew M. Rowley. Oil and Gas Jl., vol. 20, no. 48, Apr. 27, 1922, p. 12, 1 fig. Domestic consumers waste 150 billion ft. annually, hastening depletion of supply and bringing closer day of costly substitutes.

OIL FUEL.

Laundry Power Plant. Oil burning in Laundry Power Plant, Charles L. Hubbard. Nat. Engr., vol. 26, no. 5, May, 1922, pp. 192-196, 9 figs Oil substituted for coal and shows decided advantages; equipment details.

Deaths.

N. O. NELSON, founder of the firm of the N. O. Nelson Mfg. Co., St. Louis, Mo., manufacturer of heating and plumbing supplies, died October 5, in Los Angeles, California, after an illness of three weeks. He was 78 years old. Mr. Nelson founded the company which bears his name in 1877. He was an advocate of the profit-sharing idea and introduced this scheme in his own plant in 1885. When he opened his factory near Edwardsville in 1890 he founded the co-operative industrial village of Leclaire for the benefit of his employees. Later Mr. Nelson organized a chain of 63 grocery stores in New Orleans as a philanthropic enterprise. This project brought him financial trouble, making it necessary for him to file a personal petition in bankruptcy in 1918. Mr. Nelson was a Civil War veteran and was for years a prominent figure in the supply trade.

COLEMAN SELLERS, JR., president of William Sellers & Co., Philadelphia, Pa., manufacturer of machine tools and appliances in its special field, died in Bryn Mawr, Pa., August 15. Mr. Sellers had been in the employ of the Sellers firm since 1873. From 1886 to 1902 he was assistant manager. In 1902, on the death of William Sellers, he was made president of the company. He was the sixth consecutive generation of a family engaged in the mechanical arts. His father, Coleman Sellers, was a former president of the American Society of Mechanical Engineers.

Summary of Comparison of Coal, Kerosene and Gas Fuels for Space Heating to 70° F. Through 1 Sq. Ft. Cast Iron Radiation Per Heating Season

October 1 to May 1 (212 days) at 42° F. average outdoor temperature.

FUEL	HEATING SYSTEM: HOT WATER 150 B. T. U. per hour.	VAPOR 200 B. T. U. per hour.	STEAM 250 B. T. U. per hour.
ANTHRACITE COAL			
13500 B.T.U. per pound at $15.00 per ton	45.3 lbs. 30⅓ cts.	60.2 lbs. 40⅓ cts.	75.3 lbs. 50½ cts.
KEROSENE			
127679 B.T.U. per gal. at 13 cts. per gallon	3.64 gal. 47⅓ cts.	5.03 gal. 65⅓ cts.	6.07 gal. 79 cts.
GAS			
530 B.T.U. per cubic feet at $1 per 1,000 cu. ft.	485.5 cu. ft. 49 cts.	725.5 cu. ft. 72½ cts.	906.8 cu. ft. 90⅔ cts.
CENTRAL STEAM HEATING PLANTS	1 sq. ft. C. I. radiation condensing 0.25 lbs. of steam per hour at 70°.	1017 lbs. steam @ 85c. per 1000 lbs.—86c plus company's service charge.	1272 lbs. steam @ 85c. per 1000 lbs.—96c plus company's service charge.

Names and Sizes of Various

The following definitions have been compiled by the American Society of Mechanical Engineers:

DOMESTIC HARD COALS.

Names and Sizes	Will pass through	Will not pass through
"Pea"	¾-in. mesh	½-in. mesh
"Chestnut" or "Nut"..	1¼-in. mesh	¾-in- mesh
"Stove" or "Range" ..	1¾-in. mesh	1¼-in. mesh
"Egg"—In the East...	2½-in. mesh	1¾-in. mesh
"Large Egg" —Chicago ..	4-in. mesh	2¾-in. mesh
"Small Egg" —Chicago .	2¾-in mesh	2-in. mesh
"Broken" or "Grate"	4-in. mesh	2½-in. mesh

BITUMINOUS OR "SOFT" COALS.

For domestic soft coals there are no uniform names and sizes, but they are marked in the various states under about these classifications:

"Screenings" usually smallest sizes.

"Duff" goes through ⅛-in. screen.

"Number 3 Nut" goes through 1¼-in. screen, over ¾-in. screen.

"Number 2 Nut" goes through 2-in. screen, over 1¼-in. screen.

"Number 1 Domestic Nut" goes through 3-in. screen, over 1½ or 2-in. screen.

"Number 4 Washed" goes through ¾-in. screen over ¼-in. screen.

"No. 3 Washed Chestnut" goes through 1¼-in. screen, over ¾-in. screen.

"No. 2 Washed Stove" goes through 2-in. screen, over 1¼-in. screen.

"Number 1 Washed Egg" goes through 3-in. screen, over 2-in. screen.

"Number 3 Roller Screen Nut" goes through 1½-in. screen, over 1-in. screen.

"Number 2 Roller Screened Nut" goes through 2-in. screen, over 1½-in. screen.

"Number 1 Roller Screened Nut" goes through 3½-in. screen, over 2-in. screen.

"Egg" goes through 6-in. screen, over 3-in. screen.

"Lump" or "Block" goes through 6-in. screen, or over.

"Run-of-Mine" iin fine and large lumps.

Pocahontas Smokeless: Generally sized as: "Nut," "Egg," "Lump," and "Mine Run."

Cannel Coal: For fireplaces—"Hand Picked Lump"; for stoves: "Egg."

Domestic By-Product Coke: "Egg," 3-in.-2½-in.

"Large Stove," 2½-in.-2-in. "Small Stove," 2-in.-1½-in.

"Nut," 1½-in.-¾-in. "Pea," ¾-in.-½-in.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE, published monthly at Cooperstown, N. Y., for October 1, 1922.

State of New York, County of New York, ss.:

Before me, a notary public in and for the State aforesaid, personally appeared A. S. Armagnac, who, having been duly sworn, according to law, deposes and says that he is the editor of The Heating and Ventilating Magazine, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443 Postal Laws and Regulations printed on the reverse of this form to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.

Editor, A. S. Armagnac, 1123 Broadway, New York, N. Y.

Managing Editor, None.

Business Manager: Gustave Petersen, 1123 Broadway, New York, N. Y.

2. That the owners are: (Give names and addresses of individual owners, or if a corporation, give its name and the name and address of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.

A. S. Armagnac, 1123 Broadway, New York.

Gustave Petersen, 1123 Broadway, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain, not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stock holders and security holders who do not appear upon the books of the company as trustee, hold stock and securities in a capacity other than that of a bona-fide owner and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

A. S. ARMAGNAC, Editor.

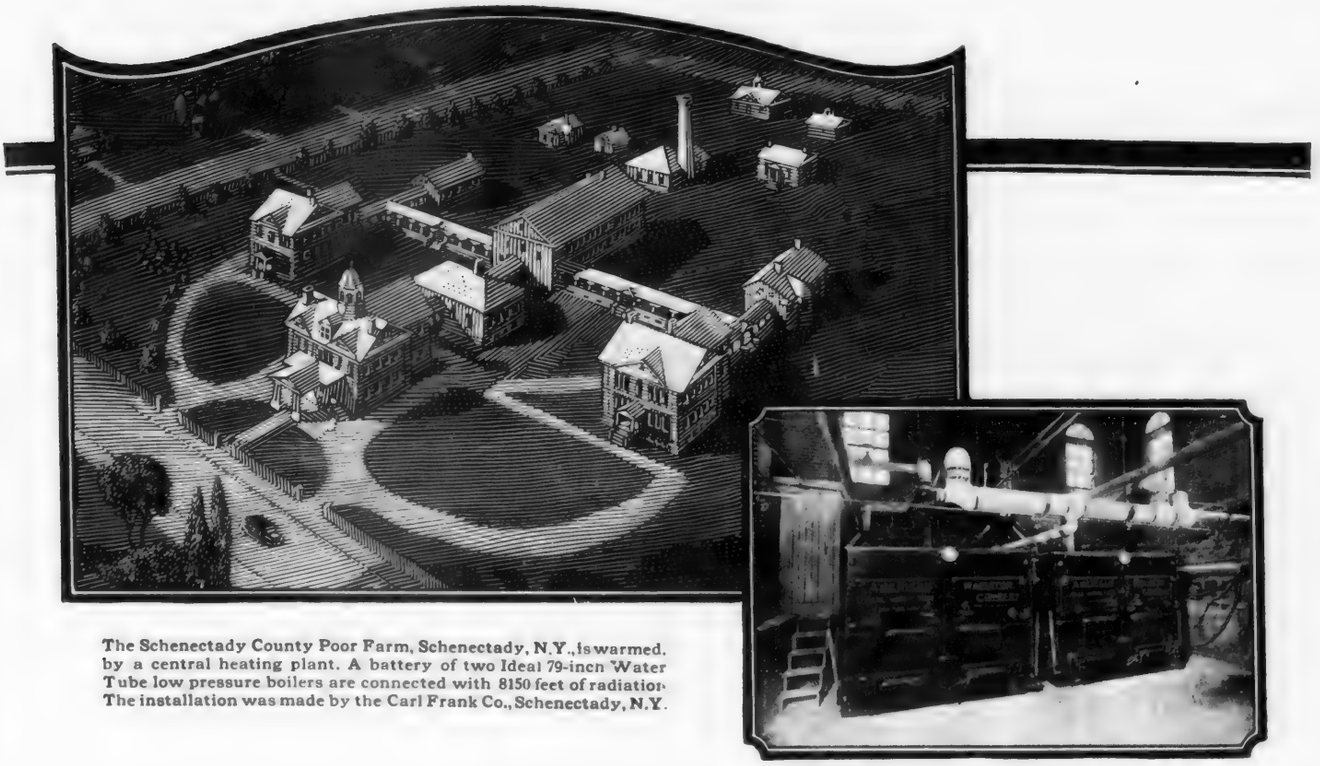
Sworn to and subscribed before me this 6th day of October, 1922.

Sol. Mayersohn.

Commissioner of Deeds No. 155.

Reg. 23065

(My commission expires June 14, 1923.)



The Schenectady County Poor Farm, Schenectady, N.Y., is warmed by a central heating plant. A battery of two Ideal 79-inch Water Tube low pressure boilers are connected with 8150 feet of radiation. The installation was made by the Carl Frank Co., Schenectady, N.Y.

Poor in pocket—Rich in warmth

THOUGH poor in pocket the tenants of the Schenectady County Poor Farm, Schenectady, N.Y., now enjoy better warmth than the owners of too many first-class homes.

And the County, last Winter, saved 50 tons of coal!

The Poor Farm consists of several buildings, distributed over a city block, and warmed from a central heating plant.

Though the old heating plant carried a constant load of from eight to ten pounds of steam, it failed to deliver adequate warmth. So the old boilers were replaced by two IDEAL 79" Low Pressure Boilers.

This is what the superintendent, Mr. Chisholm wrote at the end of the winter:

We are gratified with the change to the IDEAL 79" Boilers. Instead of carrying eight to ten pounds of steam, the entire system of 8150 feet of radiation now warms quickly on three to four pounds. And from November to April we have saved easily fifty tons of coal.

IDEAL 79" Water Tube Boilers have many new and interesting points of construction; every Architect or Heating Engineer interested in adequate heating equipment, for apartments, schools, hospitals, hotels, theatres, banks or office buildings, should have the booklet describing them.

Your name on your letterhead will bring it at once.

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

104 West 42nd Street, Dept. 106
NEW YORK

AMERICAN RADIATORS | IDEAL BOILERS

816 So. Michigan Ave., Dept. 106
CHICAGO

THE HEATING AND VENTILATING MAGAZINE—1133 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating- Hot Water

18" Stone or Concrete Wall. Lath, furring and plaster on inside

Net Exp. Wall	Direct Radiation S. or S.E	N. or N.W	W. or N.E	E. or S.W	Net Exp. Wall	Direct Radiation S. or S.E	N. or N.W	W. or N.E	E. or S.W.
20	4	6	5	5	900	188	248	231	214
40	9	11	10	9	920	192	253	236	218
60	13	17	15	14	940	197	259	241	223
80	18	22	20	19	960	201	264	246	228
100	22	28	26	24	980	206	270	251	232
120	26	33	31	29	1000	210	275	257	237
140	31	39	36	33	1020	214	283	262	242
160	35	44	41	38	1040	219	288	267	247
180	40	50	46	43	1060	223	294	272	251
200	44	55	51	47	1080	228	299	277	256
220	48	61	56	52	1100	232	305	283	261
240	53	66	61	57	1120	236	310	288	265
260	57	72	66	61	1140	241	315	293	270
280	62	77	71	66	1160	245	320	298	275
300	66	83	77	71	1180	250	326	303	279
320	70	88	82	76	1200	254	332	309	284
340	75	94	87	80	1220	259	338	314	289
360	79	99	92	86	1240	263	344	319	294
380	84	105	97	90	1260	268	350	324	295
400	88	110	102	94	1280	274	355	329	303
420	92	116	107	100	1300	280	360	335	308
440	97	121	112	105	1320	286	365	340	312
460	101	127	117	109	1340	289	370	345	317
480	106	132	122	114	1360	294	376	350	322
500	110	138	128	119	1380	298	381	355	326
520	114	143	133	124	1400	302	387	361	331
540	119	149	138	128	1420	307	393	366	336
560	123	154	143	133	1440	311	399	371	341
580	128	160	148	138	1460	316	405	376	345
600	132	165	153	142	1480	320	410	381	350
620	136	171	158	147	1500	324	415	387	355
640	141	176	163	152	1520	329	420	392	359
660	145	182	168	156	1540	333	426	397	364
680	150	187	173	161	1560	338	432	402	369
700	154	193	179	166	1580	342	438	407	373
720	158	198	184	170	1600	346	444	413	378
740	163	204	189	175	1620	351	448	418	382
760	167	209	194	180	1640	355	453	423	386
780	172	215	199	184	1660	360	458	428	392
800	176	220	205	189	1680	364	463	433	397
820	180	226	210	194	1700	368	468	436	402
840	185	231	215	199	1720	373	475	444	406
860	189	237	220	204	1740	377	481	449	411
880	194	242	225	209	1760	382	487	454	416

P.A.C.

RADIATION COMPUTING—Water Htg., 18-in. Stone or Concrete Wall. No. 13-Y.

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating · Hot Water

20" Stone or Concrete Wall Lathfurring and plaster on inside

Net Exp Wall	Direct Radiation S. or S.E	N. or N.W	W. or N.E	E. or S.W.	Net Exp. Wall	Direct Radiation S. or S.E	N. or N.W	W. or N.E.	E. or S.W.
20	4	5	5	6	900	189	233	216	203
40	8	10	10	9	920	193	237	221	206
60	13	16	14	14	940	197	242	225	211
80	17	21	19	18	960	201	248	230	215
100	21	26	24	23	980	205	253	235	220
120	25	31	29	27	1000	210	259	240	225
140	29	36	34	32	1020	214	263	245	220
160	34	42	38	36	1040	218	268	249	233
180	38	47	43	41	1060	222	274	254	237
200	42	52	48	45	1080	226	279	259	242
220	46	57	53	50	1100	331	285	264	248
240	50	62	58	54	1120	235	289	269	251
260	55	68	62	59	1140	239	294	273	256
280	59	73	67	63	1160	243	300	278	260
300	63	78	72	68	1180	247	306	283	265
320	67	83	77	72	1200	252	311	288	270
340	77	88	82	77	1220	256	315	293	273
360	76	94	86	81	1240	260	320	297	278
380	80	99	91	86	1260	264	326	302	282
400	84	104	96	90	1280	268	331	307	287
420	88	109	101	95	1300	273	337	312	293
440	92	114	106	99	1320	277	341	317	296
460	97	120	110	104	1340	281	346	321	301
480	101	125	115	108	1360	285	347	326	305
500	105	130	120	113	1380	289	352	331	310
520	109	135	125	117	1400	294	363	336	315
540	113	139	130	122	1420	298	367	341	318
560	118	146	134	126	1440	302	370	345	323
580	122	150	139	131	1460	306	374	350	327
600	126	155	144	135	1480	310	379	355	332
620	130	159	149	140	1500	315	385	360	338
640	134	164	154	144	1520	319	392	365	341
660	138	120	158	149	1540	323	398	369	346
680	143	175	163	153	1560	327	404	374	350
700	147	181	168	158	1580	331	409	379	356
720	151	185	173	163	1600	336	416	384	360
740	155	190	177	166	1620	340	419	389	363
760	159	196	182	171	1640	344	424	394	368
780	163	201	187	175	1660	348	430	398	372
800	168	207	192	160	1680	352	436	403	377
820	172	211	197	183	1700	357	441	408	383
840	176	216	201	188	1720	361	446	413	386
860	180	223	206	192	1740	365	450	417	391
880	184	228	211	197	1760	369	456	422	395

E. A. C.

RADIATION COMPUTING—Water Htg., 20-in. Stone or Concrete Wall. No. 13-Z.

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating - Hot Water

24" Stone or Concrete Wall. Lath furring and plaster on inside

Net Exp. Wall.	Direct Radiation S. or S.E	N. or N.W.	W. or N.E.	E. or S.W.	Net Exp. Wall	Direct Radiation S. or S.E	N. or N.W.	W. or N.E.	E. or S.W.
20	4	5	4	4	400	167	207	200	176
40	7	9	9	8	920	171	212	204	180
60	11	14	13	12	940	174	216	209	184
80	15	18	17	16	960	178	221	213	188
100	19	23	22	20	980	182	225	217	192
120	22	28	26	23	1000	185	230	223	195
140	26	32	30	27	1020	189	236	227	199
160	30	37	34	31	1040	192	239	232	203
180	33	41	39	35	1060	196	244	236	207
200	37	46	43	39	1080	200	248	240	211
220	41	51	47	43	1100	204	253	245	215
240	44	55	52	47	1120	208	258	249	219
260	48	60	56	51	1140	211	262	254	223
280	52	64	60	55	1160	215	267	258	227
300	56	69	65	59	1180	219	271	262	231
320	59	74	69	62	1200	222	276	268	234
340	63	78	73	66	1220	226	281	272	238
360	67	83	77	70	1240	229	285	277	242
380	70	87	82	74	1260	233	290	281	246
400	74	92	86	78	1280	237	294	285	250
420	78	97	90	82	1300	141	299	290	254
440	81	101	95	86	1320	145	304	294	258
460	85	106	100	90	1340	148	308	299	262
480	89	110	104	94	1360	152	313	303	266
500	93	115	109	98	1380	156	317	307	270
520	96	120	113	101	1400	159	322	313	273
540	100	124	117	105	1420	163	327	317	277
560	104	129	121	109	1440	166	331	322	281
580	107	133	126	113	1460	170	336	326	285
600	111	138	130	117	1480	174	340	330	289
620	115	143	134	121	1500	178	345	335	293
640	119	147	139	125	1520	182	350	339	297
660	122	152	143	129	1540	185	352	344	301
680	126	156	147	133	1560	189	359	348	305
700	130	161	165	137	1580	193	363	252	309
720	134	166	159	141	1600	196	368	358	312
740	137	170	164	145	1620	200	373	362	316
760	141	175	168	149	1640	203	377	367	320
780	145	179	172	153	1660	207	382	371	324
800	148	184	177	156	1680	211	386	375	328
820	152	189	181	160	1700	215	391	380	332
840	155	193	185	164	1720	219	396	384	336
860	159	198	200	168	1740	222	400	389	340
880	163	202	204	172	1760	226	404	393	344

R.A.C.

RADIATION COMPUTING—Water Htg., 24-in. Stone or Concrete Wall. | No. 13-AA.

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating - Hot Water

Windows - Single - Not Weather stripped

Divide Rad. by 2 if storm sash are used

Net Exp Glass	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.	Net Exp Glass	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.
5	3	4	4	4	225	152	194	180	167
10	7	9	8	7	230	155	198	184	171
15	10	13	12	11	235	159	203	188	174
20	14	17	16	15	240	162	207	192	178
25	17	22	20	19	246	166	211	196	182
30	20	26	24	22	250	169	215	200	185
35	24	30	28	26	255	172	219	204	189
40	27	34	32	30	260	176	224	208	192
45	31	39	36	33	265	179	228	212	196
50	34	43	40	37	270	183	232	216	200
55	37	47	44	41	276	186	237	220	204
60	41	52	48	44	280	189	241	224	208
65	44	56	52	48	285	193	246	228	211
70	48	60	56	52	290	196	250	232	215
75	51	65	60	56	296	200	254	236	219
80	54	69	64	59	300	203	258	240	222
85	57	73	68	63	305	206	262	244	226
90	61	78	72	66	310	210	267	248	229
95	65	82	76	70	315	213	271	252	233
100	68	86	80	74	320	217	275	256	237
105	71	90	84	78	325	220	280	260	241
110	75	95	88	81	330	223	284	264	245
115	78	99	92	85	335	227	289	268	248
120	82	103	96	89	340	230	293	272	252
125	84	108	100	93	345	234	297	276	256
130	87	112	104	96	350	237	301	280	259
135	91	116	108	100	355	240	305	284	263
140	94	121	112	104	360	244	310	288	266
145	98	125	116	107	365	247	314	292	270
150	101	129	120	111	370	251	318	296	274
155	104	134	124	115	376	254	323	300	278
160	108	139	128	119	380	257	327	304	282
165	111	143	132	122	386	261	332	308	285
170	115	147	136	126	390	264	336	312	289
175	118	151	140	130	395	268	340	316	293
180	120	156	144	134	400	271	344	320	296
185	122	160	148	137	405	274	348	324	300
190	125	164	152	141	410	278	353	328	304
195	129	168	156	145	415	281	357	332	307
200	135	172	160	148	420	285	361	336	311
206	138	176	164	152	425	288	366	340	315
210	142	181	168	155	430	291	370	344	319
215	145	185	172	159	435	296	375	348	322
220	149	189	176	163	440	298	329	352	326

R.A.C.

RADIATION COMPUTING—Water Heating, Single Windows No. 13-BB.

Copies of this Data Sheet, printed separately, 5 cents each.

EFFICIENT HEATING *demands the* JENNINGS PUMP

DUPLEX "D" UNIT CONTINUOUS OPERATION

Hill Street Theater, (Junior Orpheum Circuit) Eighth and Hill Streets, Los Angeles, Calif.

Capacity each pump 40,000 sq. ft. direct radiation, air capacity 25 cubic feet per minute in addition to a water capacity of 60 gallons per minute. The Motors are only 3 Horse Power.

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump. As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent. In other words, the cost of current to operate is cut in half.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

Quiet, reliable operation without annoyance because of shut downs, and minimum of expense for repairs, is assured if the Jennings Hytor Vacuum Heating Pump is installed on your Vacuum Heating System.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 15 gives them in detail. Write for it.

THE NASH ENGINEERING CO.
Plant and General Offices
SOUTH NORWALK, CONN.
SALES OFFICES
BOSTON—185 Devonshire Street
BUFFALO—1044 Ellicott Square
CHICAGO—1220 Monadnock Block
CLEVELAND—326 Frankfort Ave. N W
DALLAS—Dallas Bank Building
DENVER—Boston Building
DETROIT—Kerr Building
HOUSTON—Southern Pacific Building
INDIANAPOLIS—Hume-Mansur Bldg.
KANSAS CITY—Mutual Building
LOS ANGELES—218 East Third Street
MINNEAPOLIS—501 S. Sixth Street
MONTREAL—84 Inspector Street
NEW ORLEANS—521 Baronne Street
NEW YORK—350 Madison Ave
PHILADELPHIA—Stock Exchange Bldg.
PORTLAND—224 Pine Street
PITTSBURGH—Oliver Building
SALT LAKE CITY—Dooly Building
SAN FRANCISCO—Sharon Building
SEATTLE—220 Railway Exchange
ST. LOUIS—Chemical Building
TOLEDO—1-9 St. Clair Street
TORONTO—Kent Building
WASHINGTON—710 14th Street, N. W.

The NASH ENGINEERING COMPANY

SOUTH NORWALK, CONN., U. S. A

Trade and Miscellaneous Notes

Coming Events.

December 4-8, 1922.—Annual meeting of American Society of Mechanical Engineers in New York.

December 4-6, 1922.—Annual Meeting of American Society of Refrigerating Engineers, in New York.

December 7-13, 1922.—National Exposition of Power and Mechanical Engineering, Grand Central Palace.

January 23-26, 1923.—Annual meeting of American Society of Heating and Ventilating Engineers, in Washington, D. C.

Miscellaneous Notes.

Salt Lake City, Utah.—Reconstruction or changes in the heating apparatus of 96 plants were recommended during August by the city Department of Smoke Inspection and Abatement.

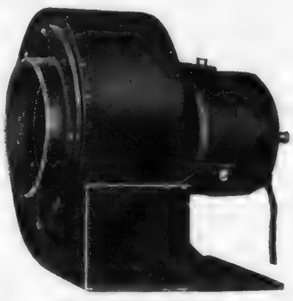
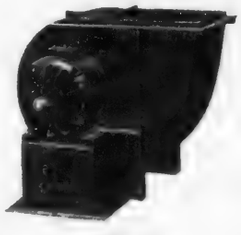
Oakland, Cal.—Charges that the fans of the Argonaut mine, in which 47 men were entombed recently, were not used in a manner to aid in saving their lives, has drawn a reply from H. M. Wolfin, superintendent of safety of the State Industrial Accident Commission. The criticism had been advanced that the fan in one of the shafts should have been used to force air into the mine to relieve the imprisoned men, instead of drawing it out. Mr. Wolfin's reply is that the delay in doing this would have permitted more poisonous fumes to reach the men and would have increased the fire. "It is agreed," he continues, "that if the fan had stopped, the fire in the Argonaut shaft, coupled with the fact that the collar of the Muldoon shaft is at a lower elevation, probably would have caused the air currents to reverse, but before such reversal would have occured, there would have been a considerable delay which would have permitted the fumes to back down upon the men and the immediate effect would have been the filling of the entire mine with noxious fumes. If the ventilation had been reversed, either by stopping the fan or changing it, the fire fighting operations in the Argonaut shaft would have had to be suspended, and during the first few hours of the fire the fire fighting operations in the Argonaut shaft offered the best promise of rescuing the men in the bottom of the mine. Reversal of the air currents would have increased the rapidity with which the fire traveled in the Argonaut shaft and would have caused it to travel down the shaft faster by reason of the fact that fresh air would have been coming from below the fire."

Marshall, Mich.—$100,000 in bonds will be sold by the Board of Supervisors, most of the proceeds of which will go towards equipping the T. B. Hospital with a heating, plumbing and electrical system.

Building Operations for September, 1922, showed a seasonal decline, but were higher than a year ago, at 44,275,000 sq. ft., as against 41,702,000 sq. ft. in September, 1921, in the 27 northeastern states. Industrial building declined from August, but business building increased; residential building remained about the same. The contracts awarded amounted in value to $271,493,000, as against $246,186,000 in September, 1921. The index numbers of building costs again rose to new high records since a year ago.

Dr. Charles Russ Richards was inaugurated president of Lehigh University, Bethlehem, Pa., on Founders' Day, October 14.

Dr. Samuel Wesley Stratton, for 21 years director of the Bureau of Stand-

REGISTERED AUTOVENT

AUTOVENT

High Efficiency Products

The marked success together with the increasing demand for Autovent products offer convincing evidence of the correctness of materials and engineering principles, employed with exactness in their manufacture.

Autovent Fans and Uniblade Blowers have gradually attained a distinctive position in the field of fan and blower production. Every improvement of electrical and mechanical science as thus far discovered has been thoroughly considered by us in their design and construction.

They are dependable, compact, durable and consume the least power. Send for bulletins giving complete details.

AUTOVENT FAN & BLOWER CO.

Formerly Batterman-Truitt Co.

730-738 W. Monroe St., Chicago, Ill.

Branch Offices in Principal Cities

ards in Washington, has been elected president of the Massachusetts Institute of Technology. He will assume his duties January 1. Dr. Stratton is a graduate of the University of Illinois, class of '84.

Eastern Supply Association held its annual meeting, October 11, at the Hotel Astor, New York. Among the subjects of special interest discussed was the deferred or "easy-payment" plan of selling supplies. One of the important points in the discussion was the fact that practically every industry is operating to-day under the deferred payment plan. The main features of the plan were presented by Edward Newald, of the Commercial Investment Trust, Inc., of New York. He offered the suggestion, among other things, that in a heating installation costing, say $250.00, 15% or 20% be the initial payment, the balance of the payments to be in equal monthly installments. The association appointed a committee to look into the plan and report at the February meeting. A talk on the arbitration of commercial disputes outside of court was delivered by Alexander Rose, an attorney and member of the Arbitration Society of America. A proposal, advanced by W. J. Woolley, manager of the National Trade Extension Bureau, for the standardization of catalogue sizes, was approved by the meeting and the recommendations as submitted were adopted. The principal speaker at the afternoon session was Former Governor Edward C. Stokes, of New Jersey. New officers were elected as folows: President, Frank W. Hubbard, W. B. Hubbard & Sons Co., Boston; first vice-president, George E. Keenan, Bayonne Supply Co., Bayonne, N. J.; second vice-president, Philip J. Faherty, Lambertville Pottery Co., Lambertville, N. J.; treasurer, Martin Behrer, Behrer & Co., Inc., New York; secretary, Frank S. Hanley, New York.

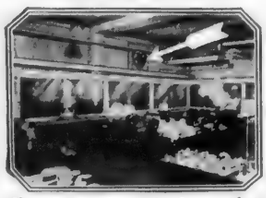
Central Supply Association held its annual meeting October 18 at the Hotel Sherman, Chicago. William J. Woolley, manager of the National Trade Extension Bureau, spoke on "Standardization of Catalogues." After a thorough survey of the subject, he said, the bureau was ready to recommend that the salesmen's catalogues be in loose-leaf form with sheets 8½ x 11 in. It was further recommended that the catalogues of manufacturers and jobbers have a page size of 7¾ x 10⅝ in. and that with the cover the size should not exceed 8 x 11

The Air You Breathe Should be As Pure as the Water You Drink

Wherever you live, shop, work or dine, attend church or theatre, you are wisely cautioned to look for good ventilation as you would for a fire escape

HIGH TRADE EFFICIENCY ILG VENTILATING MACHINERY MARK

In the office ILG Ventilation promotes health and efficiency.

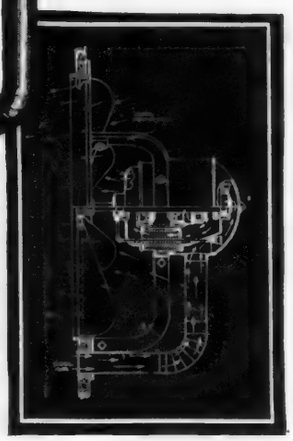


Shopping is a pleasure in the store that has ILG Ventilation.

An ILG Fan in the restaurant banishes cooking odors and oppressing heat.

ILG Ventilation in public garages is a safety-first measure.

Self Cooled Motor Fans are safeguarding your health in thousands of stores, offices, halls, theatres, restaurants, etc., everywhere.



A sectional view of the *Ilg Self-Cooled Motor Propeller Fan,* illustrating the patented method of ventilating the motor by the vacuum created at the axis of the fan, drawing a current of air from the outside through the tube or vent pipe connecting with the hood which completely encloses the motor on all sides but the front. The vent pipe serves as an intake for the air, guides it to the heart of the motor where it is carried away with the general exhaust. This all-important feature is broadly protected by basic patents.

ILG Ventilation is a guardian of human welfare in public buildings.

Foul air does not contaminate food products where there is ILG Ventilation.

ILG Ventilation promotes good health sanitation and personal hygiene.

Industrial plants recognize ILG Ventilation as the life force of man-power.

Send for Literature

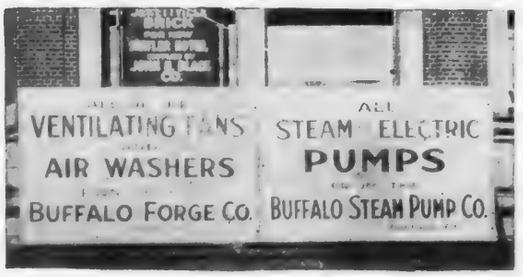
ILG ELECTRIC VENTILATING CO., 2858 N. Crawford Ave., Chicago

BRANCHES IN ALL PRINCIPAL CITIES

Architects—Geo. B. Post & Sons, New York City
Engineers—Tenney & Ohmes, New York City

A Close Up

of the New Statler Hotel in Buffalo would look like this



The Signs Speak for Themselves

Buffalo Forge Company Buffalo Steam Pump Company
Carrier Air Conditioning Company of America
Buffalo, N. Y.

in. Other addresses were delivered by P. M. Trout, field secretary of the Babson Institute on "A Practical Program for Better Business," and by Jules S. Bache, of New York, on "Europe's Condition as I Found It and Its Future as I See It." Mr. Bache's conclusion was that with the animosities and distrust existing in Europe to-day, the United States was the only nation that could lead them out of the wilderness. In concluding, Mr. Bache expressed the hope that a conference might be called in Washington to which the European countries would be invited, their leaders of business and finance, and not the politicians. In the general survey of industrial conditions by the manufacturers and wholesalers present, there was manifested either a scarcity of goods or, where that did not exist, the difficulty of shipping, which it was felt, amounted to almost the same thing. The tone of the discussions was helpful and optimistic, as it was felt that the activity in the building industry would continue.

The election of officers resulted as follows: President, E. C. Garrity, National Plumbing & Heating Supply Co., Chicago; first vice-president, E. I. Leighton, Leighton Supply Co., Fort Dodge, Ia.; second vice-president, M. M. Cochran, Cochran-Sargent Co. St. Paul, Minn.; treasurer, Edward F. Niedecken, Hoffman & Billings Mfg. Co., Milwaukee; secretary, Paul Blatchford, 1915 City Hall Square Building, Chicago.

O. P. Hood, chief mechanical engineer of the United States Bureau of Mines, has returned to his office after a three months' trip to Europe on official business. Mr. Hood visited England, Ireland, France, Italy and Germany to study low-temperature carbonization, smoke abatement, the use of lignite and peat, and combustion problems in general.

Philadelphia, Pa.—Fred R. Still, former president of the American Society of Heating and Ventilating Engineers, Director F. Paul Anderson of the society Research Laboratory in Pittsburgh; and Thornton Lewis, chairman of the society's Research Committee, were among the guests at a recent meeting of the Roofing Metal and Heating Engineers of Philadelphia, which was held in that city at the Hotel Walton. Frank K. Chew was the toastmaster. The addresses were devoted largely to the new furnace heating code, with reasons why the code did not receive the approval of the A. S. H. & V. E.

Edwin A. Scott Publishing Co., New York, publisher of Sanitary and Heating Engineering, announces the association of Raymond G. Bookhout as editor. Mr. Bookhout was previously managing editor of The Plumbers' Trade Journal, of New York.

National Association of Manufacturers reports that a majority of American factories intend to make great increases in their working forces this Fall. In the building line, the percentage of reports indicating an increase in working forces, was as follows: New York, 90%, Ohio and Pennsylvania 80%, Illinois 75%, Missouri and Iowa 100%, Massachusetts and Connecticut 60%, and New Jersey 50%.

R. H. Macy & Co., Inc., New York, has installed an oil-burning apparatus in its department store which will provide all heat, light and power for the store. The equipment requires a daily average of 6000 gal. of oil.

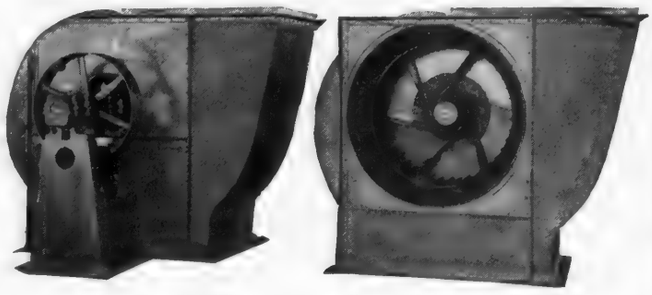
Manufacturers' Notes.

American Radiator Co., Buffalo, N. Y., has declared an extra stock dividend of 50% on its common stock. The regular dividend of $1.00 quarterly on the common and 1¾% on the preferred was also declared. On January 31, at the time of the last annual report, the company had a surplus of about $11,000,000.

Henry B. Pancoast Co., Philadelphia, Pa., has added to its line a stock of boilers and radiators. Harry J. Walther has been appointed manager of the new department. The company has long handled valves and fittings exclusively.

A. F. Gleockle, Jr. Co., Rochester, N. Y., has appointed the following agents to handle the company's line of radiator brackets: E. T. Hetherington, 1718 Sansom St., Philadelphia; Jack Major, Room 5930, Grand Central Terminal Building, New York; Appleton & Lipptrot, Newark, N. J.; F. A. Mos-

LEHIGH
MULTIBLADE
FANS



WHERE large volumes of air are to be handled at comparatively low pressures such as in heating and ventilating systems LEHIGH Multiblade Fans are guaranteed to be equal to, if not superior, to any other fans on the market.

A study of the capacity tables and characteristic curves in the Lehigh catalogue clearly proves this fact.

To further substantiate this statement, your attention is directed to the large inlet and outlet, the cone shaped hub, the absence of stay-rods, the rigid construction secured by special blades running tangent from the hub to the periphery of the wheel and also various other details.

May we send you a copy of our catalogue?

HERSH BROTHERS CO.
654 Mill Street ALLENTOWN, PA.

Clean *Warm* Air in Winter; Clean *Cool* Air in Summer

Designed to furnish fresh air from which all dust and other impurities have been removed, the "Sirocco" Air Washer is to be found in hotels, office buildings, schools and public buildings everywhere.

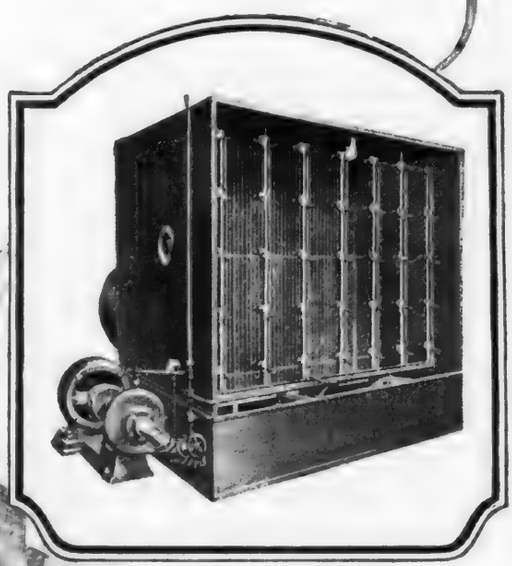
In the winter, "Sirocco" Products not only purify the air—furnishing an ample volume of clean, healthful, warmed atmosphere, without drafts—but also control the humidity automatically, insuring air with the correct percentage of moisture.

In the summer the "Sirocco" Washer not only purifies but cools the air.

Our engineers will co-operate with you in the selection and installation of ventilating equipment, and will gladly furnish recommendations.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.

(156)



Arcade Building, St. Louis, Mo.
T. P. Barnett Company, St. Louis
Architects

"Sirocco" Products
TRADE MARK
BLOWERS · EXHAUSTERS · VENTILATING FANS · AIR WASHERS · ENGINES
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

sell, 42 Gesl St., Buffalo, N. Y.; J. I. Bingham, Elmira, N. Y.; and H. F. Old, 585 Monroe Avenue, Rochester, N. Y.

American Radiator Co., Buffalo, N. Y., has purchased a site in St. Paul, comprising 15 acres at Prior and Minnehaha Streets, upon which the company will build a factory to serve the entire Northwest. The cost of the site and buildings is estimated at about $1,000,000. The new plant will employ 500 men.

McWane Cast Iron Pipe Co., Birmingham, Ala., has started construction on its new plant in East Birmingham. The first unit, according to an announcement by J. R. McWane, president of the company, will be 340 ft. x 108 ft. and ultimately will cover a 30-acre site. The daily capacity of the new plant will be 8000 ft. of pipe.

American Radiator Company's plant at North Birmingham, Ala., it is announced, is now running at 100% capacity. Recent changes in the operating force include the appointment of Frank Sellers, who comes from the Michigan plant, as superintendent of the works. C. Brider, formerly of the company's Buffalo plant, is now chemist for the North Birmingham plant. One hundred tons of pig iron are being melted daily.

O-E Specialty Co., Milwaukee, Wis., manufacturer of the O-E line of vapor heating specialties, is building a new factory building at Keefe Avenue and Humboldt Boulevard, Milwaukee, with dimensions of 600 x 200 ft. The company was incorporated in 1919 as a subsidiary of the Milwaukee Air Power Pump Company. J. R. Ball is president of both concerns, Homer S. Rogers is secretary of the O-E Specialty Mfg. Company; and L. F. Ostrander, vice-president and sales manager. The company reports greatly increased sales which have necessitated the building of larger quarters.

Success Heater & Mfg. Co., Des Moines, Ia., has inaugurated the publication of a house organ known as "Successful Heating," and devoted to the company's line of warm-air furnaces, including the Power Plus type which has been designed for large work, including auditoriums, churches and similar buildings.

Shur-Tite Mfg. Co., manufacturer of Shur-Tite boiler compound for sealing leaky boilers and radiator sections, announces that it is now located in more spacious quarters in Norwood, Cincinnati, O.

Hart & Crouse Co., Utica, N. Y., manufacturer of the "H & C" down-draft and Royal up-draft boilers, as well as warm-air furnaces, announces the removal of its Detroit offices to 315 East Adams Avenue, Detroit, where the branch has established a combined office, display room and warehouse. The location is readily accessible from Woodward Avenue and John R. Street. The company's Detroit branch was established about eight years ago under the direction of John L. Fuller, who is now western manager of the company, having charge of all the business in the Central West, with headquarters in Detroit. The company's factory is located in Utica, N. Y., where for nearly 50 years it has been among the leaders in the manufacture of heating apparatus for all classes of buildings.

The Herman Nelson Corporation, Moline, Ill., announces through its sales representative in St. Louis, Mo., the H. & P. Sales Co., that Walter A. Klein, for the past eight years with the Elliott & Barry Engineering Company, of St. Louis, has been added to its organization. Mr. Klein, who has many years of experience in the heating and ventilating field, will devote his entire time to the Univent system of ventilation and the Moline Heat system of steam circulation, both being products of the Herman Nelson Corporation.

Central Station Heating Notes.

Hillsboro, Ill.—The Southern Illinois Light & Power Company has filed an application with the Illinois Commerce Comission to discontinue its heating service in Hillsboro, on the ground that the cost of operation is greater than the revenue.

Davenport, Ia.—The city heating plant of the Peoples' Light Company was ready for operation October 1,

JAMES M. SEYMOUR
Established 1888
Lawrence St., Mechanic St. and Kirk Place
NEWARK NEW JERSEY

PROPELLER TYPE FANS

Many styles for many kinds of service. Low pressure Fans that deliver immense volumes of air at low velocity.

Cone cased Fans for higher pressures, Extreme Fans for high pressure and high velocity.

Compound Fans from 11 feet in diameter to 24 feet in diameter for Mine Ventilation.

Hyatt Roller Bearings. Anti-Friction Metallic wick, self-oiling bearings, and Ball Bearings if the purchaser prefers.

SEYMOUR FANS are not an experiment. Over 100,000 now in service. Built of the best materials. Good Workmanship. Commercially Attractive Prices.

SEND FOR BULLETINS

AIR CONDITIONING TRADE MARK

APPARATUS for maintaining artificial atmospheric conditions in industrial plants.

ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BLDG.
PHILADELPHIA

Heating and Ventilation
STANDARD DATA SHEETS
SOME SUBJECTS

B. T. U. Losses
Ducts and Flues
Chimneys
Fittings
Pipe Covering
Flow of Steam in Pipes
One Pipe Steam Systems
Vacuum Heating Systems
Vapor Heating Systems
Gravity Water Heating

225 Sheets Covering 25 Important Subjects
Price 5 Cents per Sheet

Send for folder giving full list and special prices on sets and folder

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway, New York City

Peerless Ventilator

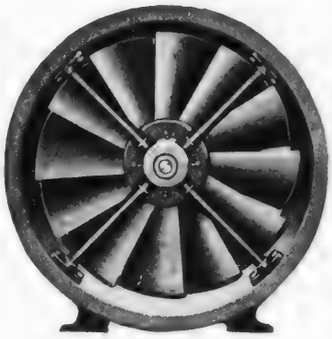
BUILT RIGHT RUN RIGHT

The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**

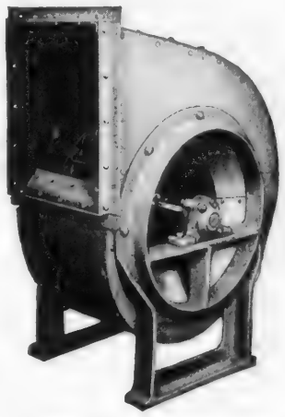
We manufacture a complete line of fan equipment and appurtenances. By concentrating on this one class of products we are able to make them better every year.

Peerless Air Washer



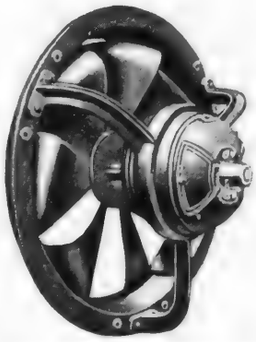
Pulley Driven Disc Fan for Mines

The old fallacy that fan equipment was a luxury is now known to be untrue; it is an economical necessity. We can give actual installations in all kinds of industries where through the wise employment of fan equipment manufacturers have improved the quality of their product, and increased production with a reduction in factory cost.

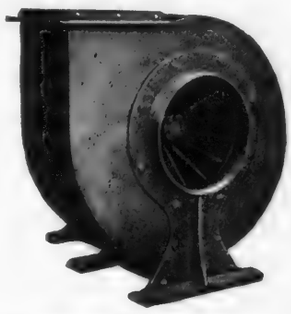


Type "C" Seri-Vane Fan

If you are interested in drying, humidifying, heating, ventilating, mechanical draft, removal of shavings or similar installations, please communicate with us. If we cannot honestly prove facts to you showing the benefits that will follow from an installation for your special problem, we will frankly so state.



Motor Driven Propeller Fan

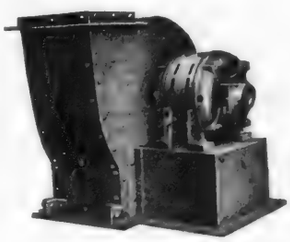


Slow Speed Planing Mill Exhauster

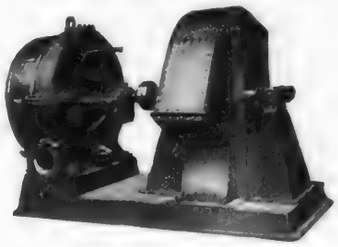
The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**

Branch Offices in Principal Cities



High Speed Type "C" Seri-Vane Fan



High Pressure Blower Direct Connected to Turbine

Stoker Fan

according to an announcement of General Manager C. N. Chubb of the company.

Sibley, Ia.—The Sibley Heating Company has been formally dissolved and its plant handed over to the town of Sibley. The plant cost $36,000 and, it is stated, has nearly paid for itself by its earnings in five seasons. It was financed by the business men, the town assuming a debt to the county in the sum of $6,300 which the county advanced for the extension of the heating mains to the court house. The remainder is to be paid in heat. The plant uses exhaust steam from the electric light plant for the larger part of the heat it sells. It has had a net earning value of about $8,000 and, it is expected, will be a fine revenue producer for the town, as well as being a convenience to its patrons.

Snohomish, Wash.—Work has begun on a steam heating plant to be run in connection with the Snohomish Steam Laundry and which will serve the business section of the town. The plant will be operated by Lester Service. Mr. Service has been granted a franchise by the council to lay the pipe mains up and down First Street.

Carroll, Ia.—A clause in the applications which heat consumers have been asked to sign by the Iowa Light, Heat & Power Company, to the effect that the applicant would agree to be bound by all the company's rules and regulations and by such additional "reasonable amendments thereto" as may hereafter be adopted, led to open defiance on the part of one consumer, F. H. Arts, whose heat had been shut off because he would not sign the application. Mr. Arts immediately appealed to the city council and a special meeting was called to determine whether the company could arbitrarily shut off the heat because a customer neglected or refused to sign such an application. The consensus of opinion among the councilmen was that the company was going "too far" in its demands. The company officials then offered to strike out the offensive clause. This proposal was accepted.

New Incorporations.

H. L. Graham & Sons, Inc., Pawtucket, R. I., capital $50,000, to engage in the heating and plumbing business. Incorporators: Daniel T. Graham, Henry E. Graham and James G. Connolly, all of Pawtucket.

Consumers Heating Co., Bad Axe, Mich., capital $20,000.

Foersterling & Bottenfield, Inc., 527 Main St., Peorial Peoria, Ill., capital $5,000, to manufacture and deal in heating plants, oil-burning ironers, etc. Incorporators: F. J. Foersterling, B. P. Foersterling and M. E. Bottenfield.

Du Page Plumbing & Heating Co., Elmhurst, Ill., capital $2500, to conduct heating, plumbing and sewarage contracting business. Incorporators: Malcolm C. McCallum, Jessie McCallum, and Agnes McCallum. Correspondent, Cleland, Lee & Phelps, 155 North Clark St., Chicago.

Model Plumbing & Heating Co., Clarksburg, O., capital $5,000. Incorporators: William D. Banks, I. H. Beall, John I. Webster, Elva Doyle and Ethel Sutton, of Clarksburg.

New Detroit Heater Co., 3957 Grand Rover Avenue, Detroit, Mich., capital $10,000.

Behnke Vapor Burner Mfg. Co., Manitowoc, Wis., capital $100,000, to manufacture a vaporizer and vapor burner. President, Albert J. Behnke, heating contractor; vice-president, A. C. Behnke; secretary and treasurer, S. H. Behnke.

Automatic Oil Heating Co., Springfield, Mass., capital $50,000, to manufacture and deal in oil heating devices, etc. President, Frederick K. Daggert; treasurer, Lawrence Davis, Southbridge, Mass.; secretary, Byron W. Reed.

Baltimore Heat Corporation, 425 St. Paul Place, Baltimore, Md., capital $30,000, to engage as engineers and contractors for heating, ventilating, electrical and plumbing work, together with complete design and installation of power plants, refrigerating and oil-burning systems. Incorporators: D. D. Thomas, W. C. Conwell and R. L. Leilich, who is also manager of the company.

New Firms and Business Changes.

C. Fuson, Memphis, Tenn., formerly

HOTEL COMMODORE

SPRAGUE ELECTRIC MOTORS

are used to drive the

VENTILATING SYSTEM

in the

HOTEL COMMODORE

Complete Service rendered to Architects and Engineers for all kinds of electrical equipments for buildings.

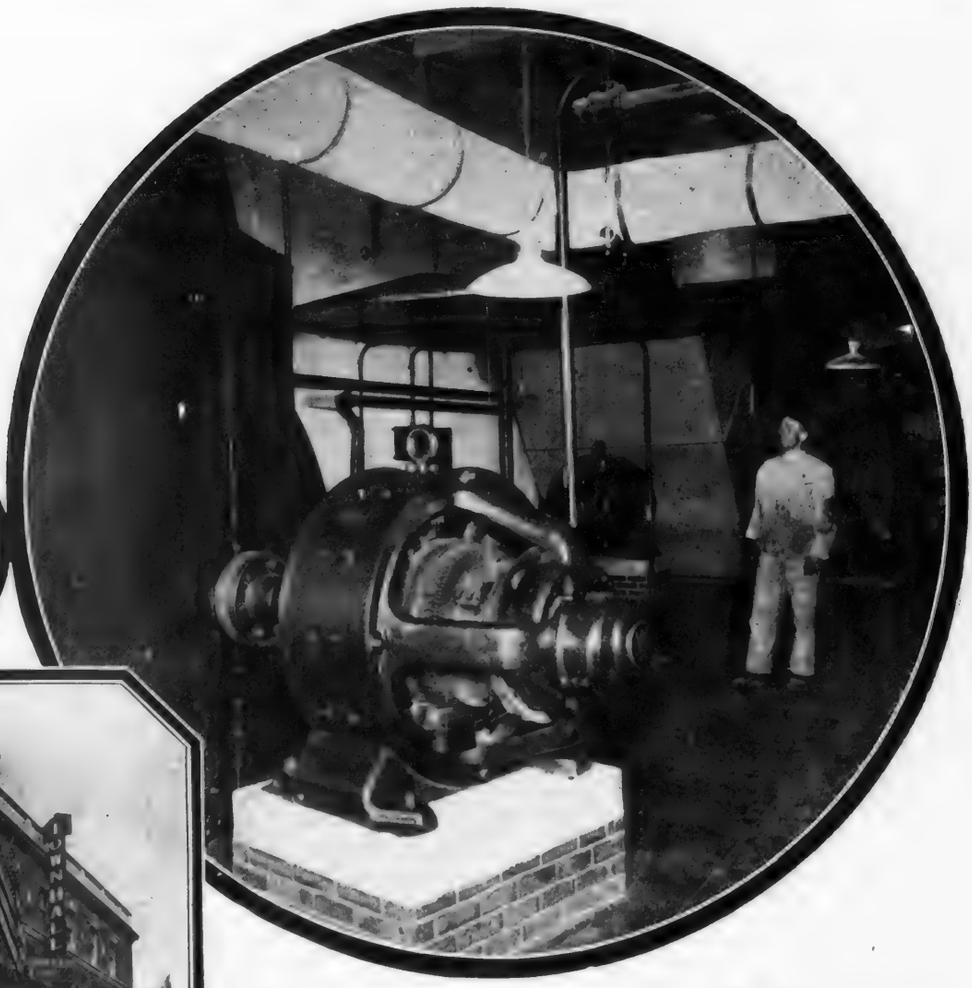
SPRAGUE ELECTRIC WORKS

Of General Electric Company

PIONEERS OF THE INDUSTRY

Main Offices 527 W. 34th St. New York

Branch Offices in Principal Cities



The Townhall of the League for Political Education, New York City

Another New York Installation

The Town Hall for the League of Political Education is another of New York's recent structures in which the ventilating equipment is Westinghouse Motor-Driven.

Together with the Bankers' Trust Building, the Seaboard National Bank and the Mt. Sinai Hospital, it represents a list of New York's latest and finest buildings. All are Westinghouse Equipped.

Westinghouse has a complete line of ventilating motors of all sizes, styles and types applicable to all industrial, private or public ventilating systems.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

Offices in all Principal American Cities

Westinghouse

connected with the steam heating department of the Union Electric Light & Power Co., St. Louis, Mo., has entered the sales engineering branch of the heating and ventilating field in Memphis where he now represents the Hesler-Bradley Co., of St. Louis, handling Kewanee boilers, Webster specialties and Nash pumps. He will be in charge of the company's branch office in Memphis. Mr. Fuson has been a familiar figure at conventions of the National District Heating Association and has a wide circle of friends whose good wishes will follow him in his new work.

Charles T. Phillips, consulting engineer, San Francisco, Cal., has moved his offices to 550 Montgomery St., San Francisco.

H. A. Erickson, who recently returned from a trip to South America as assistant engineer on one of the Shipping Board's boats, is now connected with the heating and ventilating contracting firm of Fred P. Merkel, 131 South 12th St., Newark, N. J.

Contracts Awarded.

Marek & Levin, Waterloo, Ia., submitted the lowest bid, $46,932, for the heating and plumbing of a new 100-apartment building at Walnut, Pine and Iowa Street. The completed building will cost $313,000.

Chambersburg Construction Co., Chambersburg, Pa., heating new Cumberland County Home, east of Carlisle, for $8,281.

Joseph Pollock, Pence, Wis., heating and ventilating and plumbing new school building in Pence for $13,500.

Odell Construction Co., Davenport, Ia., installing new heating plant for the R. & V. Motor Company, of East Moline. A separate building will be built 35 x 70 ft. to house the heating equipment. Heat was previously obtained from the Troy Laundry Machinery Company.

Campbell Heating Co., Kansas City, Mo., heating new Hastings Auditorium in Hastings, Neb., for $8,000.00. The plumbing contract went to Rutherford Bros., of Hastings, at their bid of $3,781.

A. J. Riley, Charleston, S. C., heating and ventilating new Chisholm Street Vocational School, in Charlestown, for $180,010.

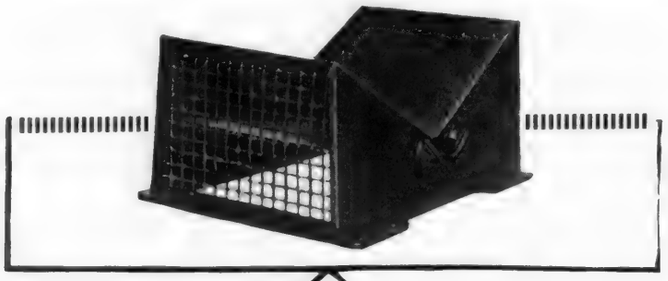
M. A. Dame & Son, Inc., Boston, Mass., heating and ventilating new West End High School at Winter Hill. The total cost of the building will be $800,000.

Publicity from the Standpoint of the Technical Journal.

Study the achievements of the civil engineer in mastering the complexities of modern building and bridge construction and one will appreciate what publicity in the technical paper has done. Human judgment and the empirical entered so largely into construction enterprises in the last few decades that dependence could be had only on the experiences of those tackling the problems, and the engineering world had to depend, as it still has, on the technical paper to keep it abreast of the times. Text-books are written necessarily after the fact; technical periodicals establish the facts for the continuing evolution and provide the background for the formulation of the fundamentals of design.

Publicity is sometimes considered from the standpoint of the individual company which seeks or secures mention. Undeniably many a company, as well as many an individual, owes business success to the commendatory references of such publicity. It follows that this is the indirect result, for in any reputable and well-conducted technical paper a successful outcome for the publicity hunter follows only because it is more or less incidental to supplying the reader with the information the publicity item contains.

In a technical paper an individual or a company is commonly an important factor from the reader's standpoint. There is perhaps no reason why the name of the individual or the name of the company should be withheld. In fact the reader is entitled to the information. The editor can attest to the numerous letters which are likely to reach him if



The "Camelback" Air Diffuser

is a device which architects and engineers have found that by its use the desired volume of fresh air is introduced and distributed throughout the auditorium at a minimum of cost and friction loss.

BECAUSE

1. Less duct work is required, saving a great expense in masonry.
2. Its construction of two way air delivery at ends, permits the discharge of the maximum quantity of air with the minimum number of diffusers.
3. Its angular shape makes it uncomfortable as a foot rest.
4. Friction loss is negligible.
5. It admits of the use of the lowest slung chair seat.
6. It is made of heavy cast iron with wire screen over ends and is guaranteed to last.
7. It has two controlling dampers, regulated independently of each other and is furnished without dampers if desired.

Every Architect and Engineer owes it to his clients to be well informed on latest ventilating practices. For that reason you should be familiar with the "Camelback." Send for Blueprints.

Knowles Mushroom Ventilating Co.
202 Franklin St. New York City
Manufacturers of Knowles Aisle-Hood, and Mushroom Notch

THE IMPACT AIR WASHER

Comprises a number of important features.

Highly Effective Dust Removal

The "Impact" Washer is guaranteed to remove 95 per cent of such dust as is found in ordinary city air. Extra-intimate contact of air and water is effected by the use of nozzles of our "Impact" type which due to their special construction and arrangement produce a dense and uniform mist or spray.

Uninterrupted Service

The "Impact" type of nozzle produces a flat, fan-shape spray by the impact of two jets from large smooth orifices, there being no internal spirals or passages whatever to become clogged with sediment. For the further prevention of plugging our special scale arrester is placed just back of each spray head. This arrester with its numerous holes each slightly smaller than the nozzle orifices, intercepts and retains all bits of sediment and scale which would not pass the nozzles. The accumulation on this strainer is slow and is quickly removed while washer is operating.

Other exclusive features. Ask for Booklet K.

THE COOLING TOWER CO., INC.

15 John St., New York

PORBECK IMPROVED HEATER

Burns Coal, Coke, Oil, Wood

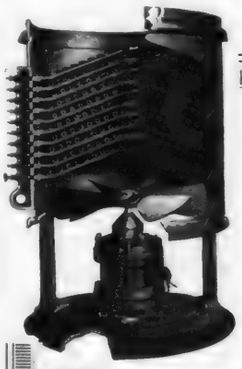
Adapted for any size building

Low in first cost and low cost in operating

No need of ducts or distributing pipes

For further particulars and prices address

PORBECK MANUFACTURING CO.
1000 N. Market St.
ST. LOUIS, MO.



A Convenient Heating Unit

easily installed for either temporary or permanent heating service.

The *Bayley* B.T.U.

is a complete self-contained heating unit with a heating surface consisting of individual spiral radiator coils one above the other (individually valved if desired). Heat is uniformly distributed by forcing the cooler air along the floor line through these coils by means of an electrically driven fan, thus creating a steady stream of tempered air and producing uniform temperature throughout the room. To install simply set on floor and connect steam and return piping and wiring to motor.

Send for bulletin today.

Bayley Mfg. Co.
Dept. "E"
MILWAUKEE, WISCONSIN

USE JUST *ONE* WING-SCRUPLEX UNIT HEATER

REG. U.S. PAT. OFF.

Instead of 30 or More Small Direct Radiators.

Save the attending cost of valves, fittings, piping, etc., and still have a better heating system. It is better because the heated air is directed just where it is needed —at the working level—no overheating of unused overhead space.

We are sure you would be interested in receiving full particulars as to how the ***Wing-Scruplex Unit Heater System*** will solve your heating problem.

L. J. Wing Mfg. Co.

Fans and Blowers — Unit Heaters
Small Turbines — Damper Regulators
HUDSON & 13TH STS., NEW YORK CITY

Vento Return Line Valve

for Vacuum and Vapor Heating Systems is a fuel-saver from the moment that it is put to work on the heating system. It never fails in its promise to make the heating system give dollar-for-dollar service for every ounce of fuel consumed. Our latest Booklet, "The Perfect Heating System," will be mailed on request to any heating engineer.

WM. S. HAINES & COMPANY
PHILADELPHIA

Steam Traps — Steam Separators — Oil Separators — Strainers
Air Traps — Exhaust Heads — Boiler Alarm Water Columns

WRIGHT AUSTIN

WA Standard with STEAM USERS SINCE '94

WRIGHT-AUSTIN CO. — DETROIT, MICHIGAN

the name or an address is omitted. Publicity of this narrow sort is admittedly a business builder. If its readers' needs are thought of in the publishing of the information, the editor is justified in giving space to the special interest publicity, for he acts as a dispassionate informing intermediary and not as a selling agent, as so many publicity managers would have him.

Publicity for a special interest is very commonly a major feature of an article. From this has arisen the opprobrious title of write-up. It is admitted that write-ups may be regarded as half truths in that they abound with the positive features of the subject discussed, naturally passing over what negative features there may be. This fact does not necessarily condemn such articles any more than advertisements or selling arguments are to be criticised because they do not reek with statements of what is or may seem derogatory. All that is essential is that in editing such matter, laudatory statements are not allowed or statements which cannot be defended by the editor. The reader is expected to discount any such article just as he does the advertisement or the salesman's eulogy.

The technical journal cannot be expected to allow statements of opinion or statements which are substantially selling arguments to go without qualification, although there is a school of technical journalism which would present its articles with the positiveness of infallible authority, to be accepted without question by the reader. A group of all around experts it is hardly humanly possible to corral, let alone to keep them as a harmonious working team. It is questionable whether even then the reader would not more or less unconsciously discount what the paper had printed.

Referring again to the matter of publicity in its broad terms, the technical journal's province is recording the developments as they occur. They naturally include the formulation of theory as it develops out of practice, but more and more is it becoming evident that for highly technical discussions the publications of our engineering societies provide the repository. The remotely practical theoretical consideration, which each technical development gets, interests the relatively few highly-specialized investigating minds of technology, and from a practical publishing standpoint the average periodical finds it difficult to justify giving space to the highly abstract, though this may be of value in the field of intensive research. The engineering society publication fills this need. It is subsidized by the support of the society memberships, so to speak, and is organized to encourage the gathering and the preservation of fundamental information. Thus in spite of the competition which technical papers have to withstand from the quest for advertising by engineering society publications, the society publications have some reason for existence in providing a medium for encouraging the far reaching investigations.

Technical journals are after all business papers, and special interest as well as broad publicity has marked the policy of their editorial conduct.

They have lived on publicity, which in turn they have provided. They have continued a useful existence and their clientele has prospered because of and not in spite of publicity matter. The reputations of the technical journals as authorities rest in part on the wise handling of publicity programs, and this has called for a refusal to consider subjects far afield, however meritorious they have been in themselves. The technical journal has been strong in some relation to its resolution not to dilute its reading columns with what the publicity man argues it should use. Publicity is welcomed when there is truth behind it, but the editor must be the court of last resort as to its availability for his own publication.—W. W. Macon, *before the Industrial Relations Conference, Department of Labor and Industry, Harrisburg, Pa.*

The Hall Gas Furnace.

One of the displays that attracted the interest of heating men at the California Industries Exposition which was held in San Francisco's Municipal Auditorium recently, was that of the Pacific Gas & Electric Company. This display included a number of types of heating devices for office buildings and homes. One of the appliances on exhibition was a Hall gas-fired warm-air furnace which had some unique features. It is marketed as a unit device, being so designed that any number

The Burt Glass Top Ventilator

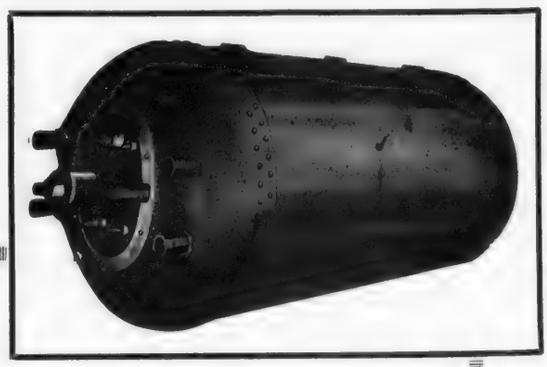
Exclusive Features that make the "BURT"—the Ideal Ventilator

1. Has sliding sleeve damper by which temperature of the building can be easily and exactly regulated.
2. This sliding sleeve damper, once adjusted, is held permanently in any position by a special attachment that does away with fastening the cord to a nail, hook or post. Due to its not having a flat surface, the damper will not collect dust and refuse.
3. The "Burt" Glass Top is a combination ventilator and skylight in which light is never shut out. It is so constructed that water will not stand on the glass. The Burt is also guaranteed to be storm proof.

Made and Guaranteed by

THE BURT MANUFACTURING COMPANY

261 Main Street AKRON, OHIO



For Durability
For Service
For Economy

For Personal and Client Satisfaction

SPECIFY

Dahlquist Copper Boilers

Dahlquist Manufacturing Company
40 West 3rd St. Boston, Mass.

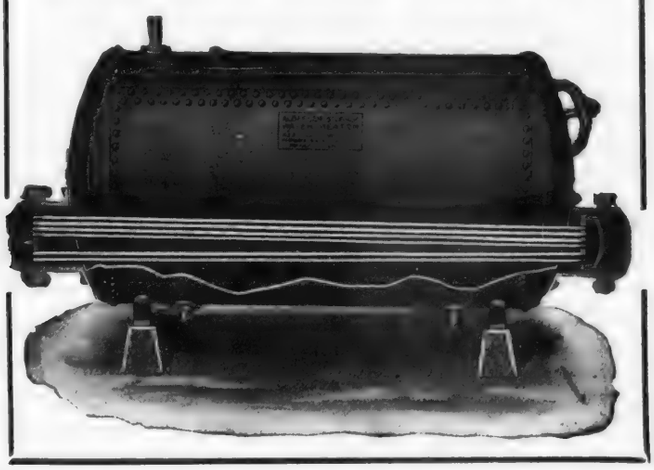
Reducing Hot Water Costs

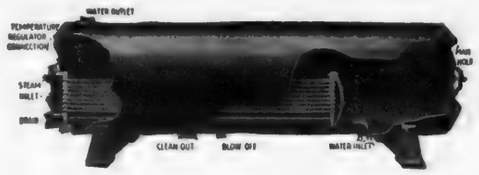
WITH

ALBERGER
(Buffalo)
HEATERS

A plentiful hot water supply will always be available at the minimum cost. Let us tell you how it is done.

Alberger Heater Company, Buffalo, N. Y.





REAL HOT WATER SERVICE

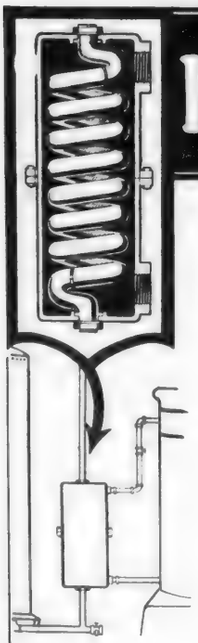
RUSSELL

Storage Heater

Write for Bulletin No. 241

THE GRISCOM-RUSSELL CO.
2155 West Street Building
NEW YORK

Philadelphia	Cleveland	Milwaukee	Charlotte
Boston	Toledo	St. Louis	San Francisco
Hartford	Detroit	New Orleans	Seattle
Rochester	Chicago	Houston	Los Angeles
Pittsburgh	Minneapolis	Dallas	Kansas City
	Syracuse	Denver	



PLENTY OF
HOT WATER
NO EXTRA EXPENSE

The most approved and economical method of heating water for domestic purposes. An abundant supply of hot water at just the right temperature, 24 hours a day, at practically no extra cost. Easily connected to outside of steam, vapor or hot water boiler; does away with fuel-wasting coil in fire pot, uses surplus heat of boiler. Does not overheat or underheat. Will not burn out, once installed.

An unusual opportunity for live dealers. Order now and be prepared for the demand being created. We furnish cooperation and practical sale helps to give you full benefit of our national advertising. Write for full details.

The Hotstream Heater Co.
"Makers of Heaters that Heat"
Cleveland, Ohio

The Hotstream
INDIRECT WATER HEATER

We also make a complete line of Gas and Kerosene Water Heaters.

Smoke!

STOP IT THE TWIN-FIRE WAY

COMPLETE combustion of volatile matter means the elimination of smoke, dirt, soot, grime and a hotter, cheaper fire. The *Twin-Fire Hand Stoker does this.* Furthermore, the Twin-Fire Principle means a flexibility of operation that makes it preferred by engineers everywhere. Its ability to burn the lower grades of coal makes a strong appeal to the plant manager.

Twin-Fire
HAND STOKER
"It Burns the Smoke"

Installed under high and low pressure boilers ranging from 50 to 1000 H. P.

FREE BOOK
tells how it's done. Send for it today.

Twin-Fire Furnace Co:
38 S. Dearborn St. Chicago

"Successful Furnace Builders Since 1898"

of sections can be assembled to form an installation of any desired capacity. The heater shown in the illustration is made up of two units. Fresh cold air enters near the top of the furnace; the intake collar may be placed at the back or at either side. This feature is characterized as exclusive and acts to increase the efficiency of the furnace as it provides for a circulation of cold air downward between the outer casing and the inner secondary casing. It also serves to keep the outside of the furnace cold, to that extent preventing loss of heat in the furnace room. The Hall unit furnace it is stated, can be operated as a gravity system or can be supplied with propeller or multivane fans of any desired capacity. The heaters are manufactured by the D. H. McCorkle Mfg. Co., 316 Twelfth St., Oakland, Cal.

DISPLAY OF HALL GAS FURNACE AT CALIFORNIA INDUSTRIES EXPOSITION.

The Specification Method for the Purchase of Coal.

The purchase of coal under specifications depending on its heating value, moisture and ash content, and other qualifications has been satisfactorily done by the Federal government and a number of municipalities and commercial concerns for some time. It is true that at certain times when abnormal conditions exist, such as during the recent war, coal specifications are practically useless and the buyer must take whatever is offered.

It is obvious that coals to be used for special purposes, such as the production of gas or metallurgical coke, would require different specifications than coal to be used for steam generation, consequently it is essential that coal specifications should be formulated by those who thoroughly understand the requirements of the coal to be purchased and also have a good knowledge of the characteristics of the various types of coal on the market.

Business Opportunities.

Business Opportunity.—For the right designer of furnaces and boilers, we have exceptional business opportunity. State experience fully. Address Anderson, care of Heating and Ventilating Magazine.

MASSACHUSETTS
DAVIDSON PROPELLER
FANS

Are especially suitable for handling large volumes of air at low resistances.

Massachusetts Blower Co.
Watertown, Mass.
Sales Offices in Principal Cities

Cycloidal
MULTIVANE FANS
TRADE MARK

Heating and
Ventilating
Apparatus
Fans and
Blowers

Garden City Fan Co.
Manufacturers since 1879
McCormick Bldg.
CHICAGO

Eastern Office
Cochran & Wrightson
47 W. 34th Street
New York

When the Seals Come, Buy Them

A LITTLE before Christmas, you will be offered some Christmas Seals. Keep them and use them on envelopes and packages. Send a check or money order to cover the small sum they cost.

When you do this, you help in the fight against tuberculosis. You help save human lives. Your help goes where help is most needed—to the house that is clouded with the threat of death. When the seals come, buy them.

Stamp Out Tuberculosis with Christmas Seals

THE NATIONAL, STATE, AND LOCAL TUBERCULOSIS ASSOCIATIONS OF THE UNITED STATES

Why

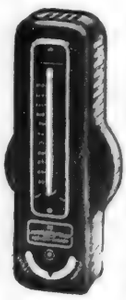
Coal costs money—even under normal conditions. Why waste it?

Urge your clients to install Automatic Temperature Regulation for economy's sake.

The best servant are those least seen. Likewise, *Powers Temperature Regulation* serves best because it is least in evidence; its perfect service is accepted, year after year, without annoying adjustments or repairs.

The true gradual action of the *Powers Vapor Disc Thermostat*, plus conscientious Engineering Service, make such results possible—and certain.

It pays your client in comfort and convenience—it pays you in future peace of mind—to be sure it is a *Powers System* wherever Temperature Regulation is desired.



The Powers Thermostat

—the heart of the Powers System of Temperature Regulation—is built on the vapor disc principle. Its sensitiveness to thermal changes is as immutable as the underlying principle of mathematics.

That's why the Powers System is famous for long service, without repairs or adjustments.

The first cost is usually higher than for other systems—the cost per year much lower.

THE POWERS REGULATOR CO
Specialists in Automatic Heat Control

2718 GREENVIEW AVE., CHICAGO

NEW YORK BOSTON

Baltimore, Md.	El Paso, Tex.	Pittsburgh, Pa.
Buffalo, N. Y.	Indianapolis, Ind.	Portland, Ore.
Butte, Mont.	Kansas City, Mo.	Rochester, N. Y.
Charlotte, N. C.	Los Angeles, Cal.	St. Louis, Mo.
Cincinnati, O.	Milwaukee, Wis.	Salt Lake City, Utah.
Cleveland, O.	Minneapolis, Minn.	San Francisco, Cal.
Des Moines, Ia.	New Orleans, La.	Seattle, Wash.
Detroit, Mich.	Philadelphia, Pa.	

THE CANADIAN POWERS REGULATOR CO., LTD.
TORONTO, ONT.

Calgary, Alt. Halifax, N. S. Montreal, Quebec.
Vancouver, B. C. Winnipeg, Man.

(1861)

DEPENDABILITY!

SYNONYMOUS WITH STANDARD "Metallic" THERMOMETERS

DURABLE
DEPENDABLE
EASY TO READ
PRACTICALLY INDESTRUCTIBLE
SENSITIVE TO CHANGING TEMPERATURES

WARRANTED ACCURATE

Standard "Metallic" Thermometers are built for long and reliable service—backed by our experience of nearly forty years as Thermometer Manufacturers—made in INDICATING or RECORDING type, with ANGLE or STRAIGHT STEM. Write us about your requirements or send for descriptive booklet. We have a variety of sizes and models from which you can select your STANDARD "Metallic" THERMOMETERS.

STANDARD THERMOMETER CO.
Clifton St., Boston 19, Mass.
Nearly Forty Years as Thermometer Manufacturers

THE HANGER FOR YOUR NEXT JOB

is the hanger that will fulfill your every demand and that is the

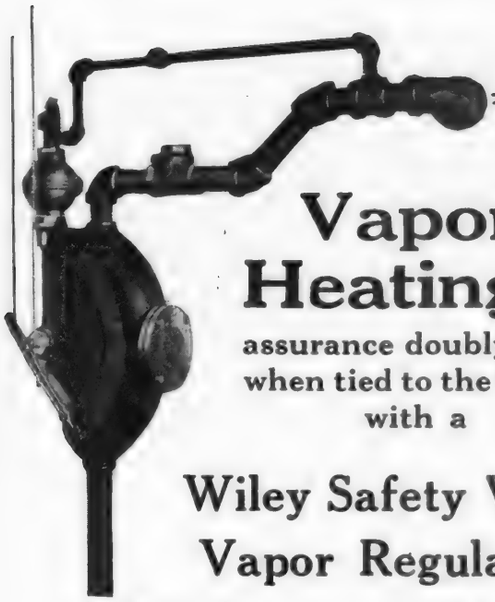
E-Z Radiator Hanger

Suitable for all wall and column radiation, is self-adjusting, is designed for vertical or horizontal alignment and require but one anchor bolt for each hanger. It is also designed to anticipate the use of temperature control valves.

STYLE R

IMMEDIATE SHIPMENT

HEALY-RUFF COMPANY
PLYMOUTH BUILDING
MINNEAPOLIS, MINN.



Vapor Heating

assurance doubly sure when tied to the boiler with a

Wiley Safety Vent Vapor Regulator

Write for your copy of booklet describing the Wiley line of vapor heating specialties.

peerless quality product manufactured and sold exclusively by

The Simplex Heating Specialty Co., Inc

Lynchburg, Va.

BAILEY METERS

BAILEY FLUID METERS record and totalize the flow of steam at any pressure or temperature, boiler feed, condensate, circulating water, or, practically any fluid flowing in a pipe. These meters are ideal for the measurement of low pressure steam as used for heating, because pressure and temperature records may be included on the same chart, giving the complete story of the steam supply. This makes it possible to calculate the actual B. T. U. supplied to a customer, and is conclusive evidence in case of any question regarding the supply. The pressure compensator has been in service for some little time. This device automatically corrects the totalizer readings for pressure changes, so that actual steam flow may be read directly from the meter.

BAILEY BOILER METERS accomplish more real results toward obtaining maximum efficiency and capacity from boiler operation than all other meters or instruments combined, because they record rate of Steam Flow from the boiler, the Rate of Air Flow through the furnace, and the Flue Gas Temperature on a single uniformly graduated chart. The Steam Flow shows the rate of steam production. The Air Flow shows the amount of air supplied for the support of combustion. The relation between these two records shows an excess or a deficiency of air supplied for the support of combustion. The Flue Gas Temperature is a sure indication of the condition of baffles and heating surface when considered in conjunction with the other records. Wind Box Pressure and Stoker Speed as well as a totalizer for the Steam Flow may be added.

BAILEY WEIR METERS record and totalize flow of water or other liquids through V-Notch weir and are used for feed water, hot well discharge or other fluids at or near atmospheric pressure.

Other Types of Meters as well as Recording and Indicating Gauges are made for different purposes, and nearly any problem in connection with the metering of fluids can be handled. Descriptive Bulletins sent on request.

BAILEY METER COMPANY

2037-E 46th ST. CLEVELAND, OHIO

An "Extension"-Style Thermometer

Like an "Extension" 'phone—Mercury Bulb in one place, Indicating Dial in another.

THERE, in a nut-shell, you have the advantages of the Columbia Reform Thermometer, for use at any dark or scorching-hot or inaccessible point where temperature must be known.

Instead of a hard-to-read mercury *tube*, you have an easy-to-read *dial*.

And instead of the dial being installed at the point where the temperature is to be taken, it can be installed on the wall, on the gauge board in engine room, or *anywhere* within a reasonable distance from point of application that is most convenient.

Columbia Reform Thermometer

does away with all the old difficulties and temper-trying inconvenience of taking temperature at points difficult of access — hence the name, Columbia "Reform" Thermometer.

Columbia Reform Thermometers are sensitive to the slightest temperature variation and are thoroughly accurate and dependable. They are mercury-actuated throughout.

This thermometer consists of a steel bulb, steel capillary tube and steel coil spring, all filled with mercury. The connecting tube can be supplied any reasonable length and the bulb is furnished for all applications.

Can be furnished for any range of temperature up to 1000° F.

Ask for Catalog G-14.

Schaeffer & Budenberg Mfg. Co. AND American Steam Gauge & Valve MFG. CO DIVISION

Makers of Columbia Recording Thermometers and Gauges with "TIME PUNCH"

BROOKLYN, N. Y.

Albany Buffalo Detroit
Baltimore Chicago Los Angeles
Boston Cleveland New Orleans
Philadelphia Pittsburgh

INSULATION MEANS CONSERVATION

At all times, more especially these times of high coal prices, INSULATION means CONSERVATION of fuel.

Make that exposed hot surface a permanent, high paying investment by insulating it with

BANNER ROCK WOOL JACKET

100% FIREPROOF

HOT SURFACE INSULATION

Adaptable for Temperatures up to 800° F.

BANNER ROCK PRODUCTS COMPANY

ALEXANDRIA **INDIANA**

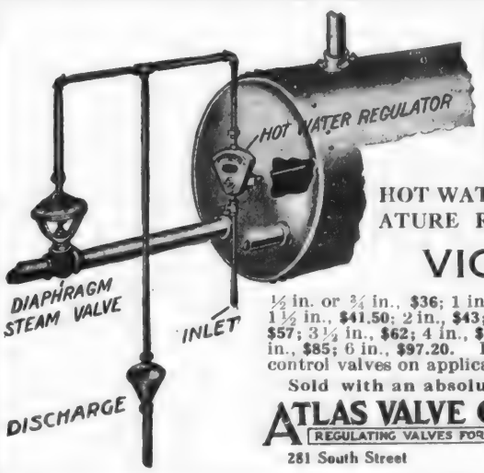
CHICAGO: 1502 Monadnock Bldg. **ST. LOUIS: 1310 Syndicate Trust Bldg.**

FOR UNDERGROUND STEAM OR HOT WATER PIPES

THE ORIGINAL RIC-WIL METHOD

embodies more original ideas, more advanced engineering, and more good practical features than any other system on the market. The material, construction, installation methods and practical results which, combined, form what we call the RIC-WIL Method, appeal with equal force to the engineer, to the practical operating man and to the business executive. Let us send you a copy of our descriptive Bulletins 1-3. Write to-day.

The RIC-WIL COMPANY CLEVELAND



NET PRICES

HOT WATER TEMPERATURE REGULATOR

VICTOR

½ in. or ¾ in., $36; 1 in., $37; 1¼ in., $40; 1½ in., $41.50; 2 in., $43; 2½ in., $47; 3 in., $57; 3½ in., $62; 4 in., $67; 4½ in., $75; 5 in., $85; 6 in., $97.20. Prices with larger control valves on application.

Sold with an absolute guarantee.

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

281 South Street Newark, N. J.

BARNES & JONES

Modulation, Vapor and Vacuum Heating Appliances

Built on 20 years' experience

BARNES & JONES

5 Melrose St., Boston 11, Mass.

New York Office
Grand Central Terminal

Representatives
Principal Cities

CAPITOL PACKLESS QUICK OPENING VALVES

Have opposing seats.

Can be used on either pressure or vacuum systems.

Perfect in every detail.

CAPITOL PRODUCTS ALWAYS SATISFY.

Write for catalog and prices.

CAPITOL BRASS WORKS
Detroit, Mich.

A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes with

Wyckoff's
Improved
Cypress Covering

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Absolutely water and steam tight. Each shell is wound with extra-heavy steel wire. Coated all over with the best known preservative—**Montezuma Asphalt.**

Write for catalog

A. WYCKOFF & SON CO.
ELMIRA, N. Y.

Will the piping last as long as the building?

IF you have regarded the corrosion and rusting away of hot water piping, heaters and boilers as inevitable, we have good news for you. The practical conservation of domestic hot water systems, so that the piping lasts as long as the building itself, is now an established fact.

The cause of the disintegration and wasting away of piping, is dissolved oxygen in the water, without which the phenomenon known as rust cannot exist. Deaerate the water and internal piping corrosion is impossible.

The Elliott Deaeration Process uses a system of heaters, employing a vacuum. Dissolved oxygen in water is removed beyond the limit of determination,—12 parts in one hundred million. The method is simple and sure. The apparatus may be placed in the boiler room and practically takes care of itself.

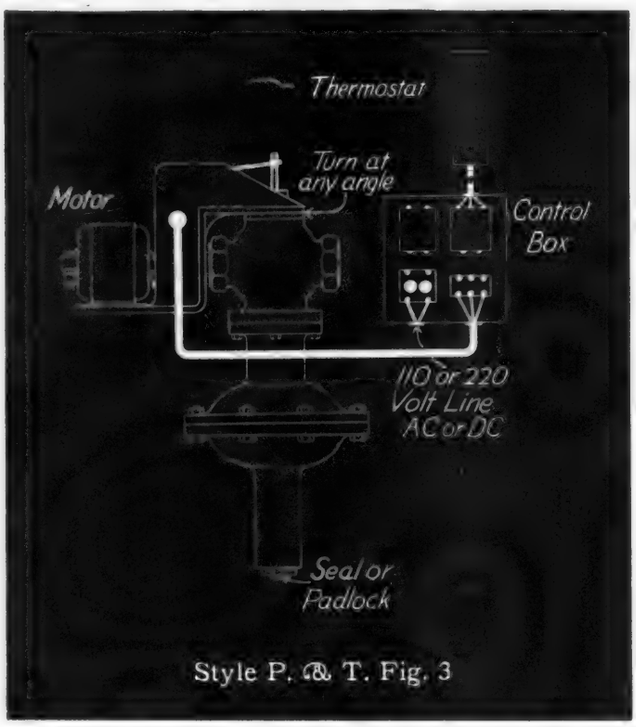
This is the logical way to prevent piping corrosion,—by removing the cause for it. If this up-to-date piping insurance appeals to you, let us give you full details.

ELLIOTT COMPANY
Pittsburgh, Pa.
General Sales Office:
Fourth Street, Jeannette, Pa.
District Offices: New York, Chicago, Philadelphia, Boston, Cleveland, Cincinnati, Detroit, St. Louis, Kansas City, Pittsburgh, Syracuse Atlanta

N-766

ELLIOTT
De-aer-ated water can't rust
Deaerator

HORNUNG PRESSURE and TEMPERATURE CONTROL VALVES



Style P. & T. Fig. 3

MASTER CONTROL

The MASTER CONTROL was designed, and is especially adapted, for control of steam heat as served from a Central Heating Plant.

The MASTER CONTROL is a combination of two valves in one, in which the lower diaphragm operates to control the pressures while the motor mounted on top of the valve operates to close off the steam when no heat is required in the building

These valves are made interchangeable so that the MOTOR DRIVEN TEMPERATURE CONTROL may be attached to the PRESSURE CONTROL at any time.

The temperature control is also furnished without the pressure control diaphragm.

The MASTER CONTROL valve has been in use for twelve years and the saving it brings to the customer is clearly a matter of record.

A 30% reduction in the meter bill is a conservative average.

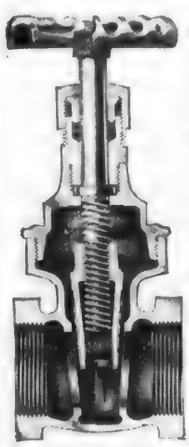
CENTRAL HEAT APPLIANCES

343 South Dearborn Street J. C. HORNUNG CHICAGO, ILL.

TRADE JENKINS MARK Jenkins Bros

STRENGTH

—found in Jenkins Gate Valves


Sectional View, Fig. 370. Jenkins Standard Brass Gate Valve

ACTUAL SERVICE has proved the Jenkins globe shaped body the best in gate valve design. This shape permits a thorough, even distribution of metal and insures valves that resist, without distortion and leakage, the severe stresses of working pressure and expansion and contraction of piping.

Jenkins design provides for use of fewer parts, each of which is strong, and heavily constructed. Standardization of manufacture insures interchangeability of parts.

Identify the genuine by the Jenkins "Diamond Mark" and signature.

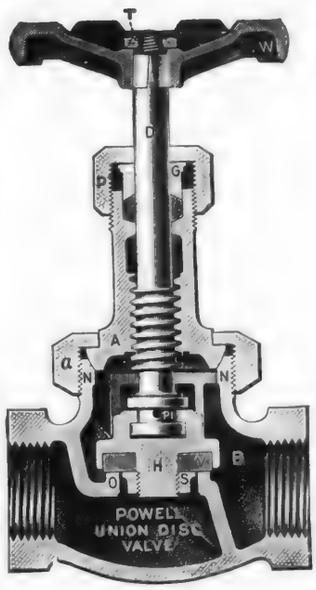
Supply houses everywhere

JENKINS BROS.

New York Boston Philadelphia
Chicago London Montreal

Jenkins Valves
SINCE 1864

POWELL VALVES



UNION COMPOSITE DISC VALVES

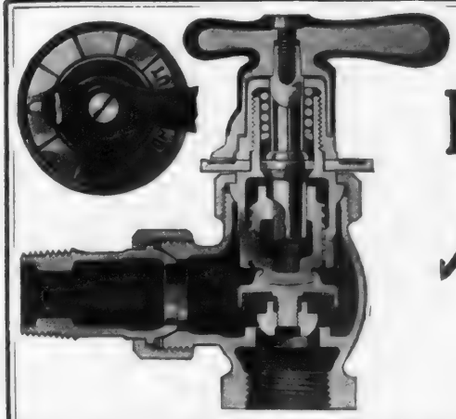
ALWAYS DEPENDABLE

For Hot Water or Steam Heating

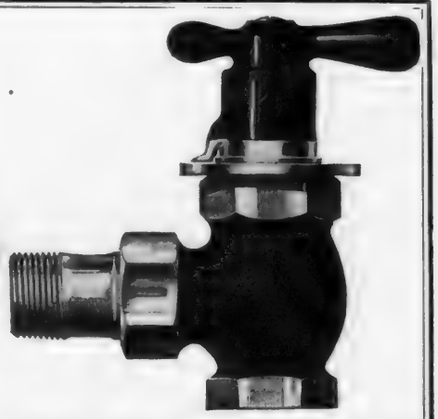
Notice the Union Bonnet Connection

Ask your dealer for Powell Valves

The Wm. Powell Company
Cincinnati, Ohio



MARSH
RE-ENFORCED
MODULATED
VALVES

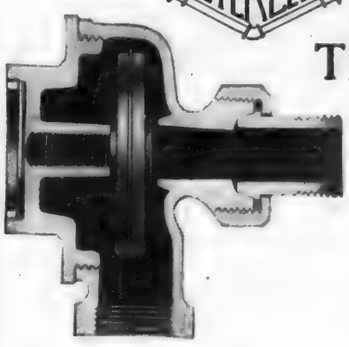


SOMETHING ENTIRELY NEW!

Nothing like it in Modulation valve handle construction, giving the same seating force in closing valve and smoothness of operation as with a wood wheel, completely doing away with side strain and necessity of having to reach over or around valve to operate same.

Catalogues, Lists and Discounts on Application

MARSH VALVE COMPANY, DUNKIRK, N. Y.



TRADE MARK STERLCO

STERLING Thermostatic Trap

100% Steam Tight
Maintains Radiators 98% Hot

These are the results of tests recently completed by the National Association of Building Owners.

Also, don't forget its other features.

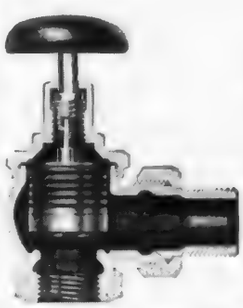
LONG LIFE

Self cleaning, which, when coupled with STERLING SERVICE insures real heating efficiency.

Write for Bulletins Nos. 31, 32 and 33 on vapor and vacuum heating and for details regarding above test

STERLING ENGINEERING COMPANY
419 Third St., Milwaukee, Wis.

Manufacturers of Vacuum and Vapor Heating Specialties



"One-Turn" Wheel Handle Packless Valve

Constructed with built-up bellows just like the Dunham Lever Handle Type. It can be opened or closed with approximately one turn of the handle. Effective for steam type or hot water type radiators and top or bottom connection. Absolutely leak proof. An important addition to the valve family that will have as great a vogue as the Dunham Lever Handle Type. Write for additional data.

C. A. DUNHAM COMPANY
230 East Ohio Street, Chicago

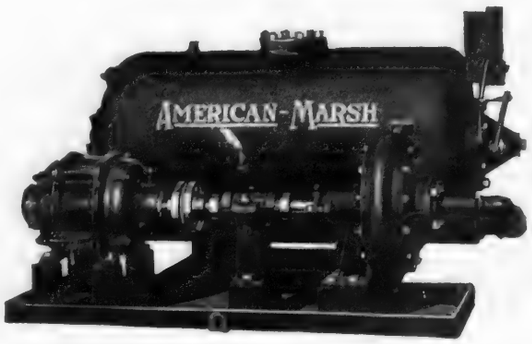
52 Branch and Local Sales Offices in United States and Canada

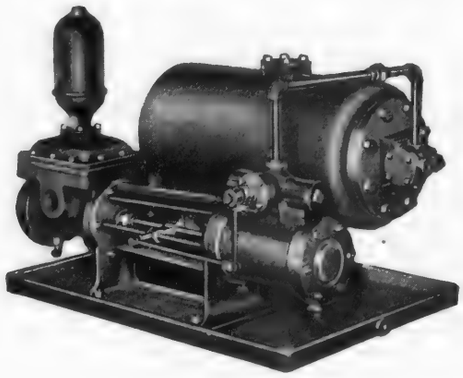
Foreign sales offices in London and Paris

The DUNHAM
REG. TRADE MARK
HEATING SERVICE

American-Marsh Condensation Pumps

Direct Acting and Centrifugal





American-Marsh Condensation Pumps are the result of over thirty-five years experience in the manufacture of high grade pumps for heating systems. They are built in the motor driven centrifugal type in both horizontal and vertical patterns, the vertical type being intended for use where the returns are laid on or under the basement floor.

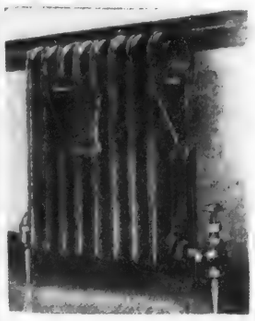
The steam driven pattern is equipped with the well known American-Marsh steam valve, the same as used on American-Marsh Vacuum Pumps. With this type of valve the pump positively cannot short-stroke or race. Steam pumps can be furnished to operate on steam pressures as low as 10 pounds. On pressures lower than this the motor driven type is recommended.

May we send you our interesting booklet covering pumps for heating systems?

AMERICAN STEAM PUMP COMPANY, Battle Creek, Mich.

HARTMANN

RADIATOR BRACKETS



WHY ?

LABOR SAVED
NO WALL STRIPS
NO BREAKAGE
NO DIRT
INEXPENSIVE

Send for descriptive circular

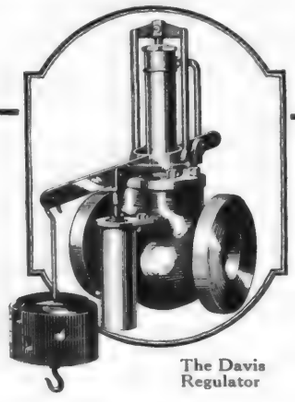
CHARLES HARTMANN CO.
Sheet Metal Constructors
985 Dean St., Brooklyn, N.Y.

Ross

Surface Barometric and Jet Condensing Equipments for Power Plants.
Main, Auxiliary, Distilling Condensers & Evaporators for Marine Service.
Distilling Condensers for Refrigeration and Chemical Plants.
Crosshead Guided" Expansion Joints
Ross Boiler Feed Water Heaters.
Ross Oil and Sugar Juice Heaters.
Gravity & Forced Circulation Heaters.
Ross Oil, Air and Water Coolers.

ROSS HEATER & MFG. CO., Buffalo, N. Y.

THE BRAND THAT LEADING ENGINEERS DEMAND



The Davis Regulator

It Saves—

money, time, patience

EVERY plant needs the Davis Regulator. Most plants using it, can use still more. That heating system will function as well or better if supplied with lower pressure steam.

The Davis Regulator's job is to see that all branches of heating systems receive the exact lower pressure steam that insures greatest saving with least steam and coal waste.

Remember that the first cost of the Davis Regulator is low, upkeep next to nothing, and saving big. You take advantage of it at once. Why not "post up" on the entire line of Davis Valve Specialties? Just write the G. M. Davis Regulator Co., 436 Milwaukee Ave., Chicago.

DAVIS VALVE
STEAM SAVERS SINCE 1875
SPECIALTIES

Try these Davis Valves where other valves fail—

Re ief Valves
Ba anced Valve
Pump Governor
Flow Regulator
Float Valve
Steam Trap
Water Control Valve
Non-Return Valve
Stop and Check Valve
Water Check Valve
Pump Stop Valve
Pilot Valve
Fluid Level Controller
Emergency Stop Valve

By Repute "Always" Reliable

Mason Reducing Valves have an extraordinary reputation for three things—long life, continuous service and reliability, which is, after all, only a natural tribute earned through merit.

MASON REDUCING VALVES

are made in many types and sizes, and every type and every size can be depended upon to reduce and maintain pressure at the proper delivery point, regardless of the fluctuation in the initial pressure.

To make your assurance doubly sure, Mason service is never separated from Mason products.

If pressure regulation problems trouble you, make use of our service.

MASON REGULATOR COMPANY

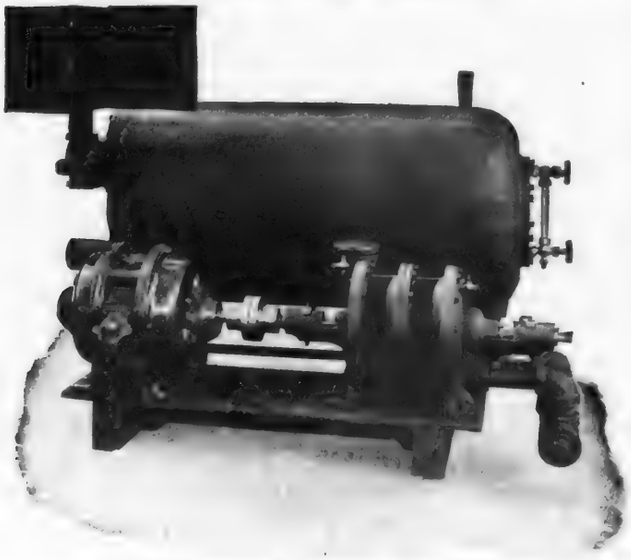
Boston, Mass. San Francisco, Cal. Montreal, Canada

YEOMANS

ELECTRICALLY OPERATED

CONDENSATION RETURN PUMPS

HORIZONTAL AND VERTICAL



SPECIAL TYPE H HIGH PRESSURE UNIT

RUGGED **RELIABLE**

Constructed to insure long life.

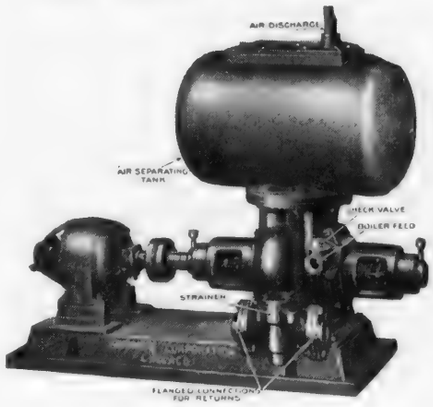
Superiority proven by years of experience.

Send for Bulletin C-5100

YEOMANS BROTHERS CO., 1421 Dayton St., Chicago, Ill.

Canadian Representatives Darling Bros., Ltd., Montreal

SKIDMORE HYDRO TURBINE VACUUM AND BOILER FEED PUMP



Set Them as They Come

Connect up returns, wire motor and run.
Constant efficiency.
Simple design.
Low power consumption.
Bronze fitted throughout.
Minimum floor space.
Large capacity.
Return connections are close to floor.
No loss of feed water due to over flowing.
Only one moving part.
Shaft carried on heavy ball bearings.
A self contained unit all on one base.
The newest and simplest device for use on a vacuum heating system.
As there are no close clearances, this pump will maintain its original high efficiency indefinitely.

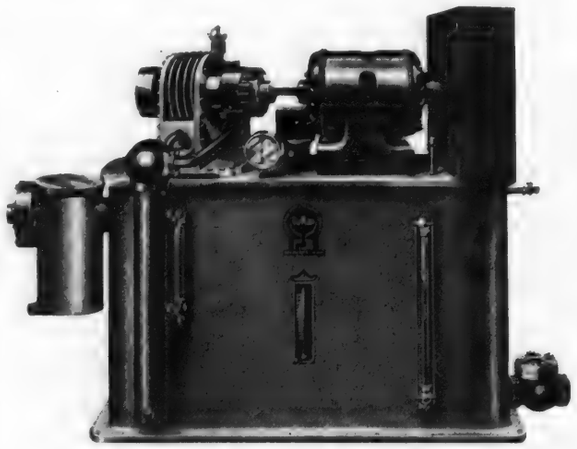
Write for Bulletin No. 1

Built in five sizes for 10 and 20 lbs. pressure, to handle 8000, 16000, 26000, 40000, and 65000 sq. ft. of radiation, for continuous service or with automatic control.

SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.



Get the Facts about this Better Pump NOW

The difference between the Du Moin and other return line pumps, is not simply in Minor refinements of design.

It is entirely new in *basic principles.*

No hot water touches any working part of the pump. Instead of pumping hot water back into the boiler, it draws the hot condensation water into a tank by creating a vacuum on the tank. Then it forces the water into the boiler.

Working parts last for years because they are kept free from the corrosive detroying effect of hot water. Less power is used for the pump runs only 25% to 50% of the time. Power bills are cut in half. Repair bills and replacements eliminated and length of life increased.

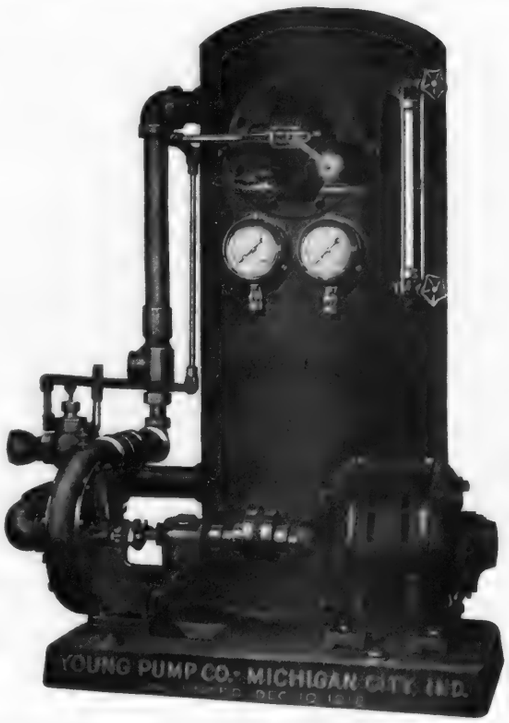
Let us send you all the facts about

Thompson's Du Moin Vacuum Return Line Pump

Write for Bulletin No. 24. Its simple explanation will quickly convince you of its merits.

Thompson Manufacturing Co.

813 Twenty-fourth St., Des Moines, Ia.



They Come This Way!

JUST as you see the "YVM" outfit in the above illustration—that is the way the Young Centrifugal Vacuum and Boiler Feed Outfits are shipped. *Complete in every detail!* When received on the job, it is only necessary to make pipe connection to the system and boiler and wire connection to the motor. Then all is ready for operation.

The "YVM" is the simplest outfit made. There are no valves, springs or other parts that require adjustment, wear out or cause repair expense. It has a very low maintenance cost—in fact, the outfit is *economical in every way.*

Made in six sizes to handle 4,000, 8,000, 16,000, 26,000, 40,000 or 65,000 sq. ft. of radiation; for continuous operation or automatic control, to meet any condition or pressure.

Young Pump Company

Michigan City Indiana

Chicago Office, 327 S. Lasalle St

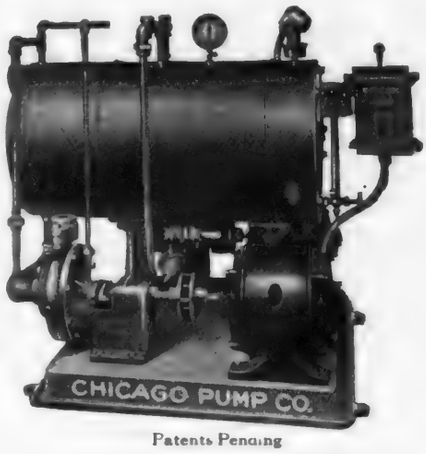
CONDO-VAC RETURN LINE PUMP

CONDENSATION-VACUUM PUMP

A return line vacuum pump, like any other pump, is designed for efficiency and economy. A pump that is wasteful or one that is constantly in need of repair is money and time lost.

Our Condo-Vac return line pump is designed and made of such materials that it will stand up under the most distressing and unusual circumstances as well as under easy operation terms.

True efficiency in a Return Line Vacuum pump can be obtained only with a CONDO-VAC because—air and water are handled by separate pumps, each driven by its own motor and each controlled independently, eliminating the waste in electricity and wear on machinery.



Patents Pending

Each pump operates only when there is actual need of its services.

Since air and vapor are approximately four-fifths of the volume handled, there is no need of running the water pump four-fifths of the time unnecessarily. These are some of the many reasons which makes the CONDO-VAC especially desirable.

THE ABOVE ADVANTAGES OF THIS PUMP ARE BUT A FEW OF THEM. SEND FOR BULLETIN 45 AND SEE THE OTHER ADVANTAGES FOR YOURSELF.

CHICAGO PUMP COMPANY

2325 WOLFRAM STREET CHICAGO, ILLINOIS

Full Complement of Building Pumping Units

Automatic, Centrifugal, Vacuum and Boiler Feed Pumps

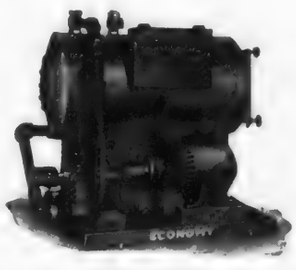
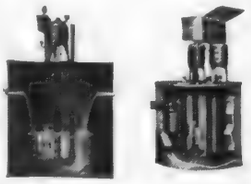


Fig. 2234

Capacities, 2500 to 65000 square feet direct radiation per standard single units.

Self Contained
High Class—Dependable

Cellar Drainers, Bilge and Sump Pumps, Sewage Ejectors



Duplex Single

Capacities, 7 to 3000 gallons per minute.

Duplex Units, Double Capacity

Made in several types and specially designed to meet all conditions.

Automatic Condensation Pumps and Receivers

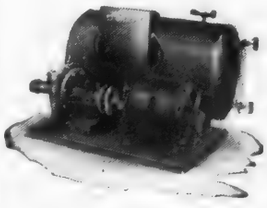
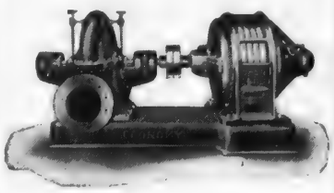


Fig. 2176

Capacities, 1000 to 125000 square feet

Made in following types: Horizontal, Vertical, and Underground. Also Piston types for extreme pressures.

Centrifugal Pumps for all purposes



Made either Single or Multi-stage

Boiler Feed house device. Hot water heating and Ice water circulating pumps.

All capacities and pressure from 5 to 5000 gallons per unit.

PERFORMANCE GUARANTEES

ECONOMY PUMPING MACHINERY CO.

122-124 N. Curtis St. Chicago, Illinois.

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.
Nash Engineering Co., So. Norwalk, Conn.

AIR CONDITIONING APPARATUS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Buckeye Blower Co., Columbus, O.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
L. J. Wing Mfg. Co., New York.

AIR COOLING AND DRYING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower, Inc., New York.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
L. J. Wing Mfg. Co., New York.

AIR ELIMINATORS.
Jas. P. Marsh & Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.

AIR SEPARATORS.
Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Buffalo, Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.

AUTOMATIC SPRINKLERS
Grinnell Co., Inc., Providence, R. I.

BLOWERS.
Fan.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Porbeck Mfg. Co., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.

Pressure.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg Co., New York.

Turbine.
L. J. Wing Mfg. Co., New York.

BOILER BREECHINGS.
Hartmann Co., Charles, Brooklyn, N. Y.

BOILER CEMENT
Shur Tite Mfg. Co., Norwood, Cincinnati, O.

BOILERS.
Copper.
Dahlquist Mfg. Co., Boston, Mass.

Down-Draft.
American Radiator Co., Chicago, Ill.
The Brownell Co., Dayton, O.
Chicago Down Draft Furnace Co., Chicago, Ill.
Hart & Crouse Co., Utica, N. Y.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.

Heating.
Advance Boiler Corp., New York.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Gorton & Lidgerwood Co., New York.
Gurney Heater Mfg. Co., Boston, Mass.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Titusville Iron Works Co., Titusville, Pa.
Utica Heater Co., Utica, N. Y.

Oil Burning
Breese Engineering, Inc., Chicago, Ill.

Power.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

COILS, PIPE.
Buckeye Blower Co., Columbus, O.
Simmons Co., John, New York.

Air.
New York Blower Co., Chicago, Ill.

COOLERS.
Oil.
Griscom-Russell Co., New York.

CONDENSERS.
Alberger Heater Co., Buffalo, New York.
Alberger Pump & Condenser Co., New York.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONVERTERS, HOT WATER.
Patterson-Kelley Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

COVERING, PIPE.
America District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.

DEHUMIDIFYING APPARATUS.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Corporation, New York.
New York Blower Co., Chicago, Ill.

DISTILLERS, (water).
Griscom-Russell Co., New York.

DRYING SYSTEMS.
(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.

DUST COLLECTORS.
Atmospheric Conditioning Corp., Phila., Pa.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.

DUST DETERMINATORS.
Atmospheric Conditioning Corp., Phila., Pa.

EQUALIZING LOOPS.
Hoffman Specialty Co., New York.

EXHAUST SYSTEMS.
Buckeye Blower Co., Columbus, O.
Hartmann Co., Charles, Brooklyn, N. Y.

ENGINES.
Steam, Automatic.
American Blower Co., Detroit, Mich.
The Brownell Co., Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.
American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.

EVAPORATORS.
Boiler Feed Make-up.
Griscom-Russell Co., New York.

EXHAUST HEADS.
Burt Mfg. Co., Akron, O.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley, Co., New York.
Simmons, Co., John, New York.
Wright-Austin Co., Detroit, Mich.

EXPANSION JOINTS.
Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

FANS, EXHAUST.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo, Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

FILTERS, (Aerating).
Griscom-Russell Co., New York.

Feed-water.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Simmons Co., John, New York.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., N. Y.

FUEL OIL BURNERS.
Breese Engineering Inc., Chicago, Ill.
Combustion Co., Chicago, Ill.

FURNACES, WARM AIR.
Twin Fire Furnace Co., Chicago, Ill.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
Bishop & Babcock Co., Cleveland, O.
McAlear Mfg. Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

GAUGES.
Draft.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

Hydraulic.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

Ounce Graduated.
Jas. P. Marsh & Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.
American Dist. Steam Co., North Tonawanda, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

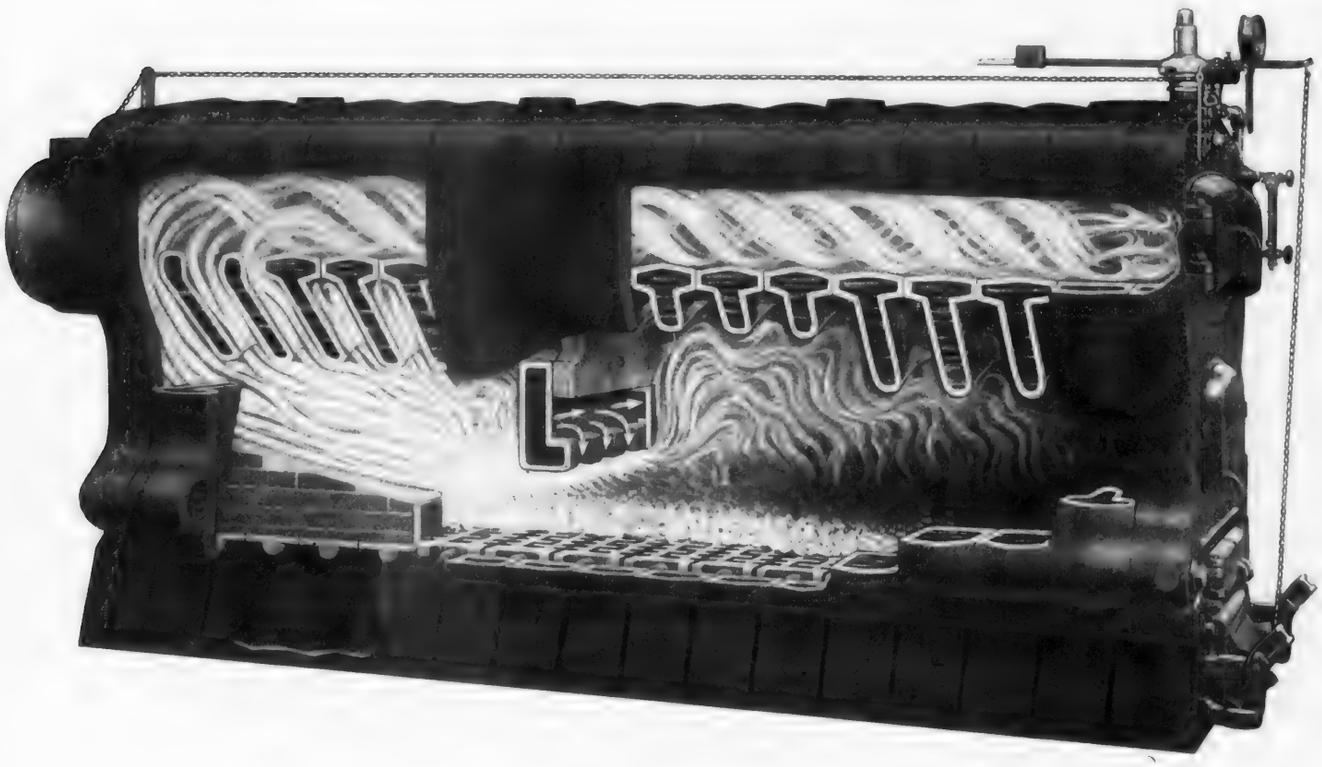
Vacuum.
Bishop & Babcock Co., Cleveland, O.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

Water.
American District Steam Co., No. Tonawanda, N. Y.
Capitol Brass Works, Detroit, Mich.
Detroit Lubricator Co., Detroit, Mich.
Jenkins Bros., New York.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.

GENERATOR COOLING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Cooling Tower, Inc., New York.

GENERATORS, (Heat)
Honeywell Heating Specialties Co., Wabash, Ind.

GOVERNORS, (pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.



UTICA-IMPERIAL

SUPER-SMOKELESS BOILERS

BURN ANY AVAILABLE FUEL

CHEAP soft coal, hard coal, coke, fuel oil or gas—any available fuel can be burned smokelessly and efficiently in SUPER-SMOKELESS Boilers. Heating Contractors throughout the country are specifying them because of their remarkably low fuel consumption and compliance with the most rigid smoke ordinances. This is especially true in all important "soft coal cities."

It is the patented "Bunsen Burner" construction of SUPER-SMOKELESS Boilers that makes them so economical and free from smoke—heated air is admitted at the very heart of the fire and all the combustible gases fully utilized for fuel. The smoke and soot are actually consumed within the boiler as a result of the additional oxygen thus supplied.

Send for Special Illustrated Bulletins describing the scientific SUPER-SMOKELESS Boiler and lists of many important installations in every type of large building.

UTICA HEATER COMPANY, Utica, N. Y.

CHICAGO: 218-220 West Kinzie St. **CLEVELAND:** 707 Union Building. **NEW YORK:** 5620 Grand Central Term'l

ATLANTA	CEDAR RAPIDS	COLUMBUS	INDIANAPOLIS	MINNEAPOLIS	PHILADELPHIA	SALT LAKE CITY
BIRMINGHAM	CHARLOTTE, N. C.	DENVER	LOUISVILLE	NASHVILLE	PITTSBURGH	SYRACUSE
BOSTON	CHATTANOOGA	DETROIT	MEMPHIS	OKLAHOMA CITY	RICHMOND	TOLEDO
BUFFALO	CINCINNATI	GRAND RAPIDS	MILWAUKEE	OMAHA	ST. LOUIS	WASHINGTON

ENGINEERS' SPECIFICATION INDEX (Continued)

HEATERS.

(Domestic Water.)

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Dahlquist Mfg. Co., Boston, Mass.
Excelso Specialty Works, Buffalo, N. Y.
Grinnell Co., Inc., Providence, R. I.
Griscom-Russell Co., New York.
Hotstream Heater Co., Cleveland, Ohio.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Closed).

Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Simmons Co., John, New York.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Can.

Feed Water, (Open).

Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.

Griscom-Russell Co., New York.
American Blower Co., Detroit, Michigan.

Pipe, Coil (Air).

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.

Portable Unit Air.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.

HEATING SYSTEMS.

Gravity and Forced Circulation, Water.
Alberger Heater Co., Buffalo, N. Y.

Vacuum.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Vapor.

American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat-Squires Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

HUMIDIFIERS.

American Blower Co., Detroit, Mich.
American Moistening Co., Boston, Mass.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Co., Inc., Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.

HUMIDITY CONTROL.

Atlas Valve Co., Newark, N. J.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Corporation, New York.
Grinnell Co., Inc., Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.

HYDROMETERS.

Jas. P. Marsh & Co., Chicago, Ill.

INSTRUMENTS.

Electric Measuring.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Indicating and Recording.

Bailey Meter Co., Cleveland, O.
Hill E. Vernon Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Standard Thermometer Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

Schaeffer & Budenberg Mfg. Co. and American Steam Gauge and Valve Mfg. Co., Division, Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.

Feed Water.

Simmons Co., John, 110 Center St., New York.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Pitot Tube.

American Blower Co., Detroit, Mich.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bailey Meter Co., Cleveland, O.

MOTORS, (Electric).

Sprague Electric Works, New York
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

PAINT, FOR HEATED SURFACES.

Ric-Wil Co., Cleveland, O.

PIPE.

Soil.

Simmons Co., John, 110 Center St., New York.

Steel.

Simmons Co., John, 110 Center St., New York.

Wrought Iron

Simmons Co., John, 110 Center St., New York.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Buffalo Forge Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Simmons Co., John, 110 Center St., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING, WOOD.

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Co., Inc., Providence, R. I.
Jenkins Bros., New York.
Simmons Co., John, New York.

PIPE CUTTING AND THREADING MACHINES.

Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.

PIPE, POWER.

Crane Co., Chicago Ill.
Grinnell Co., Inc., Providence, R. I.
Simmons Co., John, New York.

POWER PLANT SUPPLIES.

American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.

PUMPS.

Centrifugal.

Alberger Pump & Condenser Co., New York.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sprague Electric Works, New York.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Thompson Mfg. Co., Des Moines, Ia.
Trane Co., La Crosse, Wis.
Western Engineering Co., Davenport, Iowa.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.
Thompson Mfg. Co., Des Moines, Ia.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Alberger Pump & Condenser Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.
Yeomans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, O.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Hydro-High Vacuum Pump Co., Newport, Ky.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

PYROMETERS.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

RADIATOR HANGERS.

Gloeckle, Jr., A. F., Rochester, N. Y.
Hartmann Co., Chas., Brooklyn, N. Y.
Healy-Ruff Co., Minneapolis, Minn.

RADIATORS, STEAM AND WATER.

American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Simmons Co., John, New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, O.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, O.
Davis Regulator Co., G. M., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg., Chicago, Ill.
National Regulator Co., Chicago, Ill.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

The Honeywell Heat Generator

is the heart of the Honeywell Hot Water Heating System, giving absolute control together with a range of temperature from 85 to 240°. Compare this remarkable flexibility with the 212° to 220° of a good steam system or the 150° to 212° of a good vapor system.

The universal success, the never disappointing years of operation of the HONEYWELL SYSTEM have proved conclusively that the theory upon which it is based is correct. An increased and positive circulation; an instantaneous heat under perfect control, quickly increased or checked; the use of smaller valves and piping, with less water to move; the sending of even heat into radiators at extreme distance from boiler; minimum amount of piping; an easy layout for the fitter and the minimum cost of installation and operation.

Tank-in-attic or Tank-in-basement layouts as desired.

Years of use and thousands installed in the United States, Canada and other countries have proved its superiority.

Helpful Engineering Service supplied.

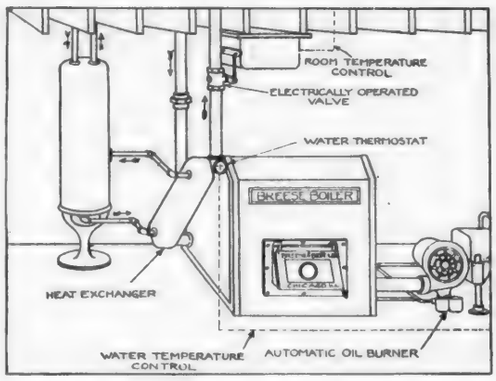
Our booklet "How to Properly Design and Install the Honeywell Method of Hot Water Heating" tells the whole story and will be mailed on request.

The Honeywell Heating Specialty Co.

WABASH, INDIANA

Manufactured in Montreal for Canadian Trade

OIL BURNING BOILERS



FOR HOUSE HEATING

BREESE ENGINEERING INC.

112 West Adams St., Chicago, Ill.

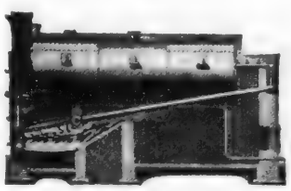
Manufacturers of

Breese Oil Burning Boilers and Automatic Hot Water Supply

Bulletin No. 10 Will be Mailed Upon Request

SMOKELESS AND COAL SAVING

DOWN DRAFT FURNACES



Designed and manufactured for any make of Water Tube, Scotch Marine or Return Tubular Boilers, for high or low pressure they can be attached to old or new boilers, by any Steam Fitter or Boiler Maker, from information given on Drawings furnished by us.

With our 30 years' experience in this line, we can guarantee proper design and workmanship.

Write for further information

CHICAGO DOWN DRAFT FURNACE CO.

115-117 So. Clinton St. **CHICAGO, ILL.**

Manufacturers of the Improved Chicago Hawley Down Draft Furnaces

SOME SUBJECTS

B. T. U. Losses
Chimneys
Ducts and Flues
Fittings
Flow of Steam in Pipes
One Pipe Steam Systems
Vacuum Heating Systems
Vapor Heating Systems
Gravity Water Heating

Heating and Ventilation

STANDARD DATA SHEETS

222 Sheets Covering 25 Important Subjects
Price 5 Cents per Sheet

Send for folder giving full list and special prices on sets and binder.

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway New York City

GURNEY BOILERS RADIATORS

FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER

GURNEY HEATER MANUFACTURING CO.

HEAD OFFICE FORT HILL SQUARE BOSTON, MASS. SHOWROOMS NEW YORK-PHILADELPHIA

ENGINEERS' SPECIFICATION INDEX (Continued)

Bishop & Babcock Co., Cleveland, O.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeanette, Pa.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

SEPARATORS.

OIL.

Burt Mfg. Co., Akron, Ohio.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Wright-Austin Co., Detroit, Mich.

STEAM.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SHEET METAL CONSTRUCTION.

Hartmann Co., Charles, Brooklyn, N. Y.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Cooling Tower Co., Inc., New York
Massachusetts Blower Co., Watertown, Mass.
Seymour, Jas. M., Newark, N. J.

STRAINERS.

OIL

Burt Mfg. Co., Akron, Ohio.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.

STEAM.

American Dist. Steam Co., No. Tonawanda, N. Y.
Elliott Co., Jeanette, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Wright-Austin Co., Detroit, Mich.

THERMOMETERS.

(Recording and Indicating.)

Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Standard Thermometer Co., Boston, Mass.

WATER.

Marsh & Co., Jas. P., Chicago, Ill.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, O.
Johnson Service Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

TRAPS.

RADIATOR.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mouat-Squires Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

RETURN.

American Blower Co., Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Mouat-Squires Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

STEAM.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Simmons Co., John, New York.
Trane Co., La Crosse Wis.
Wright-Austin Co., Detroit, Mich.

VACUUM.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES, (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Westinghoue Electric & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Spencer Turbine Co., Hartford, Conn.

VALVES.

AIR (Automatic)

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Wm. S. Haines & Co., Philadelphia, Pa.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Hoffman Specialty Co., New York.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simmons Co., John, New York.

AIR RELIEF.

American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

BACK PRESSURE.

Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.

BALANCED.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.

BLOW-OFF.

Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

CHECK.

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

GATE.

American District Steam Co., No. Tonawanda, N. Y.
Capital Brass Works, Detroit, Mich.
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

GLOBE, ANGLE AND CROSS.

Commonwealth Brass Corp., Detroit, Mich.
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Illinois Engineeringe Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

HYDRAULIC-OPERATING.

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.

NON-RETURN.

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division, Brooklyn, N. Y.
Simmons Co., John, New York.

RADIATOR.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Capitol Brass Works, Detroit, Mich.
Commonwealth Brass Corporation, Detroit, Mich.
Crane Co., Chicago, Ill.
Detroit Lubricator Co., Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
The Wm. Powell Co., Cincinnati, O.
Trane Co., La Crosse, Wis.
Simmons Co., John, New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Wilwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

REDUCING.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
The Wm. Powell Co., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

REGULATING.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.

SAFETY.

American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.
Schaeffer & Budenberg Mfg. Co. and American Brooklyn, N. Y.

STOP AND CHECK (See Valves, Non-Return.)

VENTILATING HEATERS.

American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Bros. Co., Allentown, Pa.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Massachusetts Blower Co., Watertown, Mass.

VENTILATING SYSTEMS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Porbeck Mfg. Co., St. Louis, Mo.
Seymour, Jas. M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sprague Electric Works, New York.
L. J. Wing Mfg. Co., New York.

VENTILATORS.

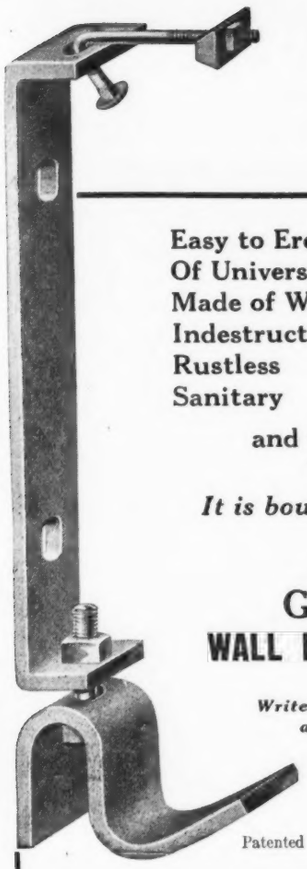
Allen Air-Turbine Ventilator Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Burt Mfg. Co., Akron, Ohio.
Hersh Bros. Co., Allentown, Pa.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
L. J. Wing Mfg. Co., New York.

MUSHROOM.

Hersh Brothers Co., Allentown, Pa.
Knowles Mushroom Ventilator Co., New York.
New York Blower Co., Chicago, Ill.

PORTABLE UNIT FANS.

(See Heater Portable Unit Air)



When a Bracket is

Easy to Erect
Of Universal Adjustment
Made of Wrought Iron
Indestructible
Rustless
Sanitary

and will fit any make wall radiator

It is bound to be Economical and Ideal

SUCH IS THE

GLEOCKLE

WALL RADIATOR BRACKET

Write for Descriptive Booklet and Trade Discounts

Prompt Shipments

Patented A. F. GLEOCKLE, Jr.
415 Bay St., Rochester, N. Y.

Specifying "Gleockle" Brackets is one way of saving your client money

Heating Engineers Recognize

Shur-Tite

Reg. U. S. Patent Office

as the foremost boiler cement for permanently repairing cracks or leaks in boiler and radiator sections.

Shur-Tite is a powder, 100% efficiency, never evaporates nor deteriorates and every can is positively guaranteed to do what we claim for it.

By using **Shur-Tite** you are assured of good profits on all work. Keep a supply of **Shur-Tite** in stock for emergency calls.

The Shur-Tite M'f'g Co.

Norwood, Cincinnati, Ohio

Carrier Engineering Corporation

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

750 Frelinghuysen Ave.
NEWARK, N. J.
New York
Boston Philadelphia
Buffalo Chicago

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

AIR CONDITIONING
AND
DRYING

Humidification Dehumidification Cooling
Heating Ventilation Purification

We invite correspondence

Make "Every day a *good* day" with
MANUFACTURED WEATHER

Peerless Engineering Co.

Lock Box 859, Cincinnati, Ohio

Hydraulic Mechanical Electrical
ENGINEERS
HEATING VENTILATION
Designs, Specifications
Water Power, Water Supply
Suburban Lighting and Power

Surveying or Layouts, Grading and Leveling Up, Foundations, Retaining Walls, Millwrighting, Water Power, Water Supply, Piping all kinds, Bridges, Steel, Reinforced Concrete Tanks, Tanks and Towers, Arches, Garages, Silos, Warehouses, Factory Buildings, Farm Buildings.

GURNEY BOILERS RADIATORS

FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER

GURNEY HEATER MANUFACTURING CO.

HEAD OFFICE FORT HILL SQUARE BOSTON, MASS. SHOWROOMS NEW YORK-PHILADELPHIA

ADVERTISERS' INDEX

Advance Boiler Corp. 7
Alberger Heater Co. 87
Alberger Pump & Condenser Co. 12
Allen Air-Turbine Ventilator Co. . 25
American Blower Co. 79
American District Steam Co. 18
American Radiator Co. 69
American Steam Pump Co. 96
Atlas Valve Co. 92
Atmospheric Conditioning Corp. .. 80
Autovent Fan & Blower Co. 75

Bailey Meter Co. 91
Banner Rock Products Co. 92
Barnes & Jones 92
Bayley Mfg. Co. 85
Bishop & Babcock Co. 15
Breese Engineering, Inc. 103
Buckeye Blower Co. 23
Buffalo Forge Co. 77
Burt Mfg. Co. 86

Capitol Brass Works 93
Carrier Engineering Corp. 105
Chicago Down Draft Furnace Co. . 103
Chicago Pump Co. 99
Clarage Fan Co. 2
Combustion Co. 8
Commonwealth Brass Corp. 14
Cooling Tower, Co., Inc. 84
Crane Co. 11

Dahlquit Mfg. Co. 86
Davis Regulator Co., G. M. 96
Detroit Lubricator Co. 13
Dole Valve Co. ..... Front Cover
Dunham Co., C. A. 95

Economy Pumping Machinery Co. 99
Elliott Co. 93
Excelso Specialty Works 9

Garden City Fan Co. 88
Gleockle, Jr., A. F. 105
Gorton & Lidgerwood Co. 22
Griscom-Russell Co. 87
Gurney Heater Mfg. Co. 103-105

Haines & Co., Wm. S. 85
Hartmann Co., Chas. 96
Healy-Ruff Co. 90
Herbert Boiler Co. 8
Hersh Bros. Co. 78
Hill, E. Vernon Co. 24
Hoffman Specialty Co. 108
Honeywell Heating Specialty Co. 103
Hornung, J. C. 94
Hotstream Heater Co. 87
Hydro-High Vacuum Pump Co. .. 16

Ilg. Electric Ventilating Co. 76
Illinois Engineering Co. 20
Illinois Malleable Iron Co. 6
International Heater Co. 6

Jenkins Bros. 94
Johnson Service Co. 28

Kennedy Valve Co. 12
Kewance Boiler Co. 5
Knowles Mushroom Ventilator Co. 84

Marsh & Co., Jas. P. 3
Marsh Valve Co. 95
Mason Regulator Co. 97
Massachusetts Blower Co. 88
McAlear Mfg. Co. 26
Mouat-Squires Co. 18

Nash Engineering Co. 74
National Regulator Co. 10
Nelson Corp., H. W. 21
New York Blower Co. 81

O-E Specialty Mfg. Co. 22
Oil City Boiler Works 4

Patterson-Kelley Co. 25
Peerless Unit Ventilator Co. 3
Peerless Engineering Co. 105
Porbeck Mfg. Co. 85
Powell Co., Wm. 94
Powers Regulator Co. 90

Ric-Wil Co. 92
Ross Heater & Mfg. Co. 96

Sarco Co. 20
Schaeffer & Budenberg Mfg. Co. and American Steam Gauge & Valve Mfg. Co., Division 91
Seymour, James M. 80
Shur Tite Co. 105
Simmons Co., John 106
Simplex Heating Specialty Co. .. 91
Skidmore Corp. 97
Skinner Bros. Mfg. Co. 107
Spencer Turbine Co. 28
Sprague Electric Works 82
Standard Thermometer Co. 90
Sterling Engineering Co. 95

Thompson Mfg. Co. 98
Titusville Iron Works Co. 4
Trane Co. 19
Twin Fire Furnace Co. 87

Union Steam Pump Co. 17
Utica Heater Co. 101

Webster & Co., Warren 26
Westinghouse Elec. & Mfg. Co... 83
Whitlock Coil Pipe Co. 10
Wing Mfg. Co., L. J. 85
Wright-Austin Co. 85
Wyckoff & Son Co., A. 93

Yeomans Bros. Co. 97
Young Pump Co. 98

JOHN SIMMONS CO

110 CENTER STREET, NEW YORK

DISTRIBUTORS OF

"NATIONAL" Tube Steel Pipe

"BYERS" Wrought Iron Pipe

JARECKI MALLEABLE AND CAST FITTINGS

POWELL HIGH-GRADE VALVES

AND SPECIALTIES FOR

AUTOS, TRUCKS, GAS, GASOLINE and OIL ENGINES

WE CARRY IN STOCK

"A. B. C. DETROIT" Return Traps

PLUMBING SUPPLIES

FIRE FIGHTING EQUIPMENT

PIPE BENDS and COILS

In Iron, Steel, Brass and Copper

VAN STONE JOINTS

WELDED HEADERS

HAVE YOU A COPY OF OUR CATALOGUE IN YOUR FILE FOR READY REFERENCE?

Every Skinner User Will Tell You

Ask any user of Skinner Bros. (Baetz Patent) Heaters and he will tell you that they are the most satisfactory and economical factory heaters he ever used.

Skinner Bros. (Baetz Patent) Heaters will keep every part of the open space in a factory at a warm, comfortable working temperature at all times, regardless of weather conditions, building construction or exposure. No pipes or ducts are used as warm air carriers—you save the expense of needless heating fittings and have more factory space available for necessary machinery and equipment.

Mechanical Details

Steam-Coil Type

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a powerful fan-wheel. Coils are heated by exhaust or live steam. Cold air is drawn into the heater by the fan, impelled upward and around the coils, and after being heated, is diffused through outlet hood to every part of the open area. No pipes or ducts used. The fan is operated by any power available.

Direct-Fired Type

Where steam is not available, we supply our direct-fired type DF, which burns coal, coke, wood, gas or oil. Built on the same scientific principle as type SC. The fan is operated by any power available.

Simple and Economical—Fully Guaranteed

Due to their unit construction, Skinner Bros. (Baetz Patent) Heaters are very simple and economical—they utilize exhaust or live steam at any pressure and need to be operated only a few hours daily.
Every Skinner Bros. (Baetz Patent) Heater is fully guaranteed when installed as directed by our Engineers. Send for list of Skinner users. Ask their opinion—they will tell you the story of Skinner heating satisfaction.

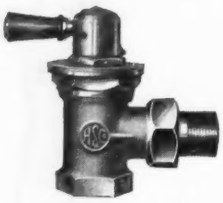
SKINNER BROS. MFG. CO., Inc.

Main Office: 1426 So. Vandeventer Ave., St. Louis, Mo.

Factories: St. Louis, Mo., and Elizabeth, N. J.

Boston, 455 Little Bldg.
Buffalo, 712 Morgan Bldg.
Chicago, 1713 Fisher Bldg.
Cincinnati, Ohio
Cleveland, 622 Marshall Bldg.
Detroit, 318 Scherer Bldg.
Kansas City, 337 Lee Bldg.
New York, 1712 Flatiron Bldg.
Pittsburgh, 8 Wood St.
Spokane, 419 First Ave.
Washington, D. C., 724 Evans Bldg.
San Francisco, Monadnock Block

Skinner Bros.
BAETZ PATENT HEATING SYSTEM



HOFFMAN
"CONTROLLED HEAT"
IS POSITIVE

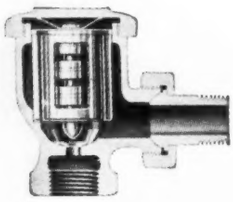
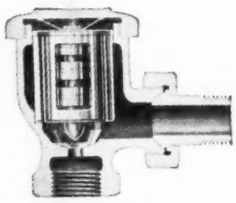
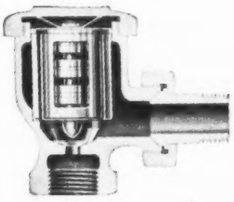
The Hoffman No. 7 Adjustable Modulating Valve Accurately controls the amount of steam admitted to each radiator. It modulates.

The Hoffman No. 8 Return Line Valve controls the radiator outlet, discharging all air and condensation without steam loss.

The Hoffman Differential Loop controls the boiler water line, holding it constant under all pressures. "Controlled Heat" means "Conserved Coal."

Specify these reliable positive-acting five year guaranteed specialties.

HOFFMAN SPECIALTY COMPANY

WATERBURY CONN.

Boston Philadelphia Minneapolis
New York Chicago Los Angeles